Appendix A

SR-101L Northwest Area Intersections Traffic Analysis

SR-101L, Thunderbird Road to 67th Avenue
Bell Road, 92nd Avenue to 59th Avenue

Prepared for

MARICOPA ASSOCIATION of GOVERNMENTS

Prepared by

BURGESS & NIPLE

1500 N. Priest Drive
Suite 102
Tempe, AZ 85281

June 2019

6/4/2019

Table of Contents

1.0 Introduction 1
1.1 Study Area 1
1.2 Stakeholder Input 3
2.0 Previous Studies 4
2.1 ADOT SR-101L Adaptive Ramp Metering Project, 2019 (in progress) 4
2.2 City of Peoria Greenway Road and SR-101L Traffic Interchange, 2019 (in progress) 4
2.3 MCDOT Bell Road Adaptive Signal Control Technology Comprehensive Study, 2019 (in progress) 4
2.4 ADOT Five Year Transportation Facilities Construction Program, June 2018 4
2.5 MCDOT Active Transportation Plan, June 2018 5
2.6 City of Glendale Capital Improvement Plan, June 2018 5
2.7 City of Glendale 10-Year Transportation Program, June 2018 5
2.8 City of Peoria Capital Improvement Program, June 2018 5
2.9 MCDOT 2019-2023 Transportation Improvement Program, June 2018 6
2.10 North Glendale Park-And-Ride Study, May 2018 6
2.11 ADOT Loop 101 Mobility Partnership, November 2017 6
2.12 MCDOT Bell Road Adaptive Signals, June 2017 6
2.13 MCDOT Transportation System Plan 2035, March 2017 7
2.14 City of Glendale Transportation Plan, June 2009 7
3.0 Land Use 8
4.0 Existing and Future Transportation Network 13
4.1 Existing Network 13
4.2 Future Network 13
4.3 Access 13
4.4 Traffic Volume 18
4.4.1 Existing Turning Movement Counts 18
4.4.2 Future Turning Movement Counts 18
4.4.3 Existing and Future ADT 24
4.5 Traffic Signal Timing Plans 24
5.0 Safety 26
5.1 SR-101L TI Safety Analysis 26
5.2 SR-101L Mainline Safety Analysis 30
5.3 Bell Road Intersection Safety Analysis 32
6.0 Existing and Future Traffic Analysis 37
6.1 Methodology 37
6.1.1 MAG Travel Demand Model 37

6.1.2 Traffic Forecasting 38
6.1.3 Synchro Model 39
6.1.4 Highway Capacity Software (HCS) Modeling 41
6.1.5 Microsimulation Model 41
6.1.6 Macrosimulation Model 42
6.2 Existing (2018) Conditions Analysis Results 44
6.2.1 SR-101L Existing Capacity Analysis 45
6.2.2 Bell Road Existing Capacity Analysis 46
6.2.3 Network-Wide Existing Capacity Analysis 48
6.3 Future (2040) Conditions Analysis Results 49
6.3.1 SR-101L Future Capacity Analysis 49
6.3.2 Bell Road Future Capacity Analysis 52
6.3.3 Network-Wide Future Capacity Analysis 54
6.4 Greenway TI Analysis 55
7.0 Conclusion 56

List of Figures

Figure 1.1 – Study Area Map....2
Figure 3.1 – Existing Land Use....9
Figure 3.2 – Future Land Use....12
Figure 4.1 – Existing Transportation Network....15
Figure 4.2—SR-101L TIs: Access Points....16
Figure 4.3 – Bell Road: Study Area Access Points....17
Figure 4.4 – Turning Movement Count Map....19
Figure 4.5 – SR-101L Existing Turning Movement Counts....20
Figure 4.6 – Bell Road Existing Turning Movement Counts....21
Figure 4.7 – SR-101L Future Turning Movement Counts....22
Figure 4.8 – Bell Road Future Turning Movement Counts....23
Figure 4.9 – Existing and Future ADT....25
Figure 5.1 – Crash Map....28
Figure 6.1 – Study Area Microscopic Model....42
Figure 6.2 – Matrix Estimation: 2040 p.m. Link Correlation....44
Figure 6.3 – Matrix Estimation: 2040 p.m. Turn Correlation....44

List of Tables

Table 1 – Existing Land Use 8
Table 2 – Future Land Use 11
Table 3 – SR-101L TIs: Injury Severity by TI 26
Table 4 – SR-101L TIs Collision Manner by TI 29
Table 5 – SR-101L: Injury Severity by Segment 30
Table 6 – SR-101L Mainline Collision Manner by Segment 31
Table 7 – SR-101L: Injury Severity and Collision Manner 32
Table 8 – Bell Road: Injury Severity by Intersection 33
Table 9 – Bell Road Collision Manner by Intersection 34
Table 10 – Bell Road: Injury Severity and Collision Manner 35
Table 11 – Bell Road: Pedestrian and Bicycle Crashes by Severity and Intersection 36
Table 12 – LOS Thresholds for Signalized Intersections 39
Table 13 – SR-101L TIs Existing (2018) Capacity Analysis Results 45
Table 14 – Bell Road Intersection Existing (2018) Capacity Analysis Results 47
Table 15 – Network-Wide Existing (2018) Capacity Analysis Results 49
Table 16 – SR-101L TIs Existing and Future Capacity Analysis Comparison 50
Table 17 – SR-101L TIs Future (2040) Capacity Analysis with Optimized Timings 50
Table 18 – SR-101L Future (2040) Mainline Segment LOS 52
Table 19 – Bell Road Intersections Future (2040) Capacity Analysis Results 53
Table 20 – Network-Wide Capacity Analysis Results 55
Table 21 – Greenway TI Analysis Results 55
Table 22 – Key Study Findings 56

List of Appendices

Appendix A – Turning Movement Counts
Appendix B – Existing and Future Average Daily Traffic Volumes
Appendix C – Synchro Results
Appendix D – City of Glendale Crash Data
Appendix E – Bell Road Crash Rates

1.0 Introduction

The State Route 101 Loop (SR-101L) Northwest Area Intersections Traffic Analysis (Study) was conducted by the Maricopa Association of Governments (MAG). The purpose was to establish capacity and operational needs based on 2018 existing and 2040 future no-build conditions for Traffic Interchanges (TI)s between Thunderbird Road and 67th Avenue. The study also assessed the potential need for a new TI at Greenway Road and reviewed existing and 2040 future year operations at intersections on Bell Road from 92nd Avenue to 59th Avenue.

1.1 Study Area

SR-101L is a freeway serving nearly 200,000 vehicles per day, connecting the cities of Phoenix, Glendale, Peoria, and others to Interstate 17 (I-17), Interstate 10 (I-10), State Route 51 (SR-51), and State Route 202 Loop (SR-202L). Bell Road is a major arterial serving approximately 40,000 to approximately 60,000 vehicles per day, depending on the location. Land use is predominately commercial along Bell Road within the Study limits. The traffic signals along Bell Road currently operate using an adaptive signal control strategy, Rhythm In|Sync. The adaptive traffic signal system was implemented through a partnership between MAG, Maricopa County Department of Transportation (MCDOT), Arizona Department of Transportation (ADOT), the cities of Glendale and Peoria within the Study limits, and the cities of Phoenix, Scottsdale and Surprise. Each agency maintains control of its own signals.

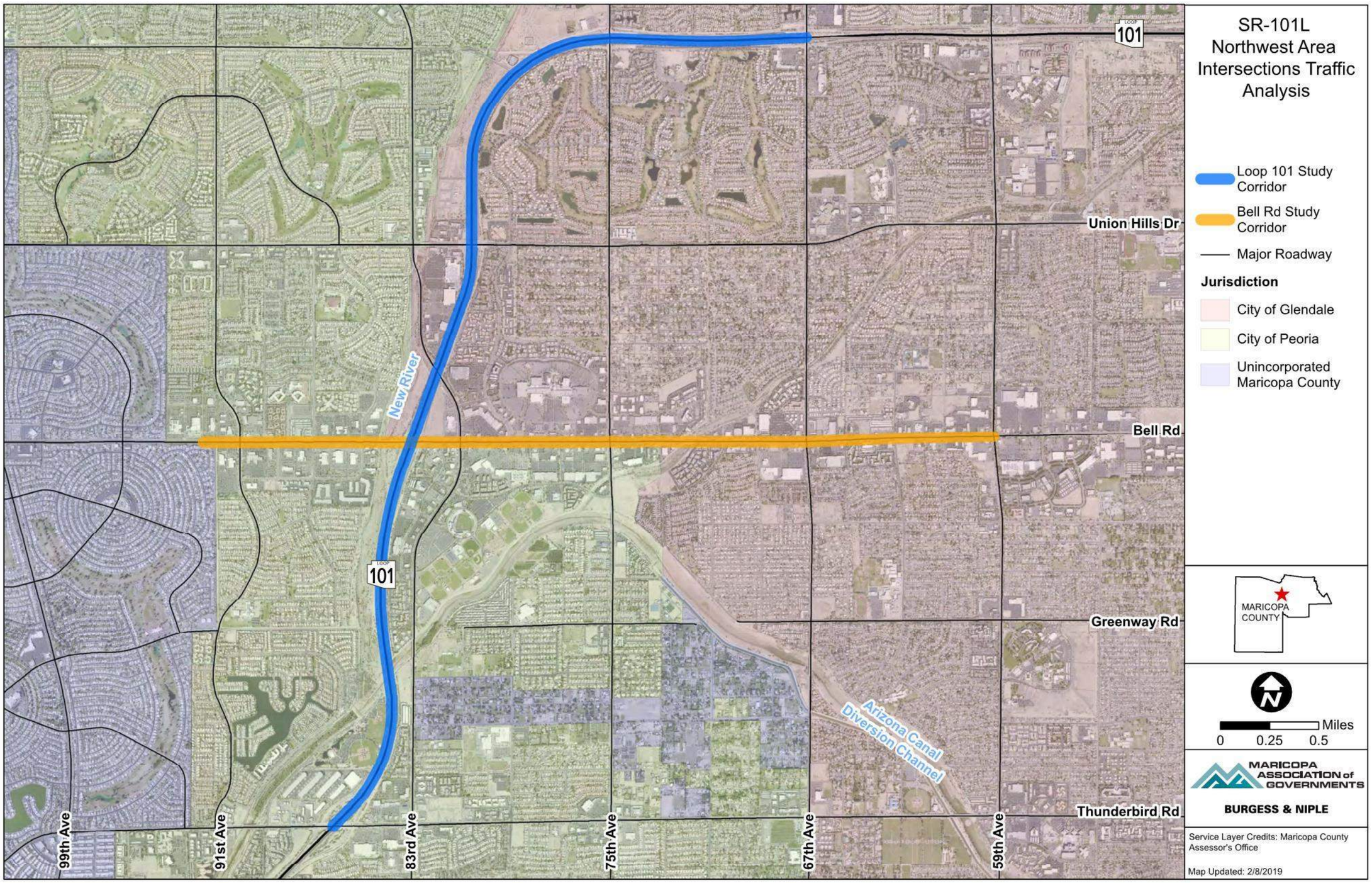
The Study Area, ***Figure 1.1***,consists of two distinct corridors: SR-101L between the Thunderbird Road and 67th Avenue TIs (5.5 miles) and Bell Road between the 92nd Avenue and 59th Avenue intersections (4 miles). The Study assessed the following TIs:

- SR-101L and Thunderbird Road;
- SR-101L and Bell Road;
- SR-101L and Union Hills Drive;
- SR-101L and 75th Avenue; and
- SR-101L and 67th Avenue.

The Study assessed the following intersections on Bell Road:

- 92nd Avenue;
- 91st Avenue;
- 87th Avenue;
- 84th Avenue;
- 83rd Avenue;
- 79th Avenue;
- 77th Avenue;
- 75th Avenue;
- 73rd Avenue;
- 69th Avenue;
- 67th Avenue;
- 63rd Avenue; and
- 59th Avenue.

Figure 1.1 – Study Area Map



1.2 Stakeholder Input

During the kick-off meeting, stakeholders expressed interest in specific areas for analysis, including:

- 75th Avenue TI;
- Potential new TI at Greenway Road; and
- Bell Road and 83rd Avenue intersection.

75th Avenue TI

The south-to-eastbound left-turn movement, in particular, does not have the capacity to serve the demand. Existing traffic counts suggest demand for this movement is over 1,000 vehicles in the peak hour, expected to increase in the future.

Potential Greenway Road TI

Interest has been expressed if a new partial TI at Greenway Road would have the potential to alleviate congestion at the SR-101L Bell Road and Thunderbird Road TIs.

Bell Road and 83rd Avenue Intersection

The Bell Road and 83rd Avenue intersection lies between the SR-101L and Bell Road Single Point Unit Interchange (SPUI) and Arrowhead Towne Center shopping center. There is currently high traffic demand on all movements and congestion-related safety concerns. A previous Road Safety Assessment (RSA) recommended an east-to-south right-turn lane, however, this was not previously pursued due to right-of-way needs and additional pedestrian crossing times.

2.0 Previous Studies

This section summarizes known and available plans and studies completed during the past 10 years within the Study Area. Relevant improvements and plan recommendations from the previous studies are included.

2.1 ADOT SR-101L Adaptive Ramp Metering Project, 2019 (in progress)

ADOT, in partnership with Phoenix, Glendale, and Peoria, is advancing an Adaptive Ramp Metering project on SR-101L between I-10 and I-17. The adaptive ramp metering project is part of the Loop 101 Mobility Project. It incorporates components of Integrated Corridor Management to reduce crashes and reduce response time. Each ramp in the corridor, including the five that are part of the Study Area, will be evaluated for improvements to ramp metering.

2.2 City of Peoria Greenway Road and SR-101L Traffic Interchange, 2019 (in progress)

The city of Peoria is evaluating geometric alternatives for a partial TI in the vicinity of Greenway Road at SR-101L. Six preliminary alternatives were developed and evaluated for cost, impacts to surrounding community, impacts to developable city-owned land in the vicinity of the TI, and traffic considerations. The evaluation also factored in recent improvements to the adjacent roadways and long range city planning.

2.3 MCDOT Bell Road Adaptive Signal Control Technology Comprehensive Study, 2019 (in progress)

MCDOT funded a study to evaluate the performance of different Adaptive Signal Control Technologies (ASCT) in four separate project areas along Bell Road. The study will complete a comprehensive review of the newly installed ASCT along Bell Road and will review available data to perform a comprehensive before and after evaluation for each area. The performance of the different ASCT systems will also be evaluated and compared.

2.4 ADOT Five Year Transportation Facilities Construction Program, June 2018

ADOT prepared the 2019-2023 Current Five-Year Transportation Facilities Construction Program to provide a framework for developing projects over the next five-year period. The purpose of the Program is to account for spending of funds on projects ready to advertise within two years of the Program or to establish implementation plans for projects still in preparation. The program identified plans for adaptive ramp metering between I-10 and I-17 on SR-101L, including the Study Area. The program also

identified a plan for the design of an additional general-purpose lane in both directions between the I-10 and US-60 Grand Ave on SR-101L.

2.5 MCDOT Active Transportation Plan, June 2018

MCDOT developed the Active Transportation Plan (ATP) to identify needs and actions to improve the existing active transportation network. The 2018 MCDOT ATP supersedes the MCDOT 1999 Bicycle Transportation System Plan (BTSP). The ATP's purpose is to provide guidance and investments about where, when, why, and how to logically and meaningfully increase active transportation. The study identified Thunderbird Road from 91st Avenue to Del Webb Boulevard as one of five corridors with the highest number of pedestrian and bicycle crashes in Maricopa County. The ATP also identified a need for a sidewalk/path connection on both sides of 99th Avenue from Olive Avenue to Thunderbird Boulevard.

2.6 City of Glendale Capital Improvement Plan, June 2018

The city of Glendale's 2019-2028 Capital Improvement Plan (CIP) is part of its 2018-2019 Annual Budget Book. The CIP is a ten-year roadmap to creating, maintaining, and paying for Glendale's present and future infrastructure needs. The plan identifies improvements to 59th Avenue from Glendale Avenue to SR-101L which include the elimination of lane drops, addition of turn lanes, selected widening, and installation of medians. This project has been deferred.

2.7 City of Glendale 10-Year Transportation Program, June 2018

The city of Glendale maintains a 10-year Transportation Program that identifies the transportation needs of the community, and develops an implementation strategy to address those needs, based on available revenues and community priorities. This program is updated annually. The program identifies limited funds for unspecified improvements to Bell Road between 51st Avenue and SR-101L.

2.8 City of Peoria Capital Improvement Program, June 2018

The city of Peoria developed a 10-year CIP in 2018 to identify infrastructure and facilities in need of design, construction, and maintenance to deliver municipal services to its residents and businesses. The program identified multiple locations within the Study Area for street improvements, along with other maintenance programs necessary to maintain safety and accessibility throughout the city of Peoria. The program identifies a Quality of Life initiative to add and improve bus shelters on 83rd Avenue throughout the city, including the intersection with Bell Road. The program also identifies the construction of a right-turn lane at 83rd Avenue and Bell Road for eastbound to southbound traffic, funded for fiscal year 2020. The Peoria Auto District on Bell Road

from SR-101L to West City Limits is identified as a phased project to enhance the identity and theme of the District and will include improvements to the roadway.

2.9 MCDOT 2019-2023 Transportation Improvement Program, June 2018

The MCDOT annual Transportation Improvement Program (TIP) contains planned roadway system improvements for the County. The TIP allows MCDOT to plan five years of future projects through the development process. The program identifies the continuation of the Bell Road Adaptive Signals project, which overlaps with this project's Study Area. Pavement preservation projects, arterial mill and overlay, and MASH guardrail evaluation are programmed throughout Maricopa County and may include the Study Area as needs arise.

2.10 North Glendale Park-And-Ride Study, May 2018

Valley Metro conducted the North Glendale Park-and-Ride study to assess a new location for a Park-And-Ride in the Northwest Valley. The previous site location for this Park-And-Ride was west of SR-101L and Union Hills Drive. The new Park-And-Ride location will serve the SR-101L corridor; the study recommended it be located on 75th Avenue just north of the SR-101L. The location is planned to open by 2023, contingent upon federal funding. Two other sites—55th Avenue and SR-101L and 67th Avenue and Union Hills Drive—are viable options if the recommended location is not chosen.

2.11 ADOT Loop 101 Mobility Partnership, November 2017

Led by the Federal Highway Administration (FHWA) and ADOT, together with the Loop 101 Mobility Partnership, the Loop 101 Mobility Study addresses the collective goals of reducing congestion, increasing reliability, and improving incident and event management on SR-101L and adjacent arterials. The project encompasses the entirety of the 61-mile SR-101L corridor, including the Study Area. Proposed improvement technologies include: a Decision Support System (DSS) to help recommend the best set of Integrated Corridor Management (ICM) responses; Adaptive Signal Control Technology (ASCT) for key arterial corridors; Connected Vehicle (CV) applications for transit and incident response vehicles; adaptive ramp metering technology; and an Integrated Traveler Mobility application to provide citizens real-time traffic updates and to provide assistance to visually and/or hearing-impaired users at pedestrian crossings.

2.12 MCDOT Bell Road Adaptive Signals, June 2017

The Bell Road Adaptive Signals project was conducted by MCDOT in partnership with the cities of Surprise, Peoria, Glendale, Phoenix and Scottsdale. The purpose of this project was to install real-time ASCT systems along Bell Road, near and at the four freeway interchanges (SR-303L, SR-101L, I-17 and SR-51). The automated system enables traffic controllers to respond to traffic demand fluctuations in real-time,

dynamically updating signal control parameters like cycle length and split times to improve travel times and reduce stops for vehicles traveling the corridor.

2.13 MCDOT Transportation System Plan 2035, March 2017

MCDOT developed the 2035 Transportation System Plan (TSP) to plan for long-term transportation needs on Maricopa County's transportation network. The plan incorporated three horizon years: 2020, 2025, and 2035. The Design section of the TSP identifies corridors near the Study Area that are projected to exceed an acceptable Level of Service (LOS) by each of the horizon years. Bell Road from 111th Avenue to Del Webb Boulevard and 103rd Avenue from US-60/Grand Avenue to Thunderbird Road are both corridors expected to exceed the acceptable LOS by 2020.

2.14 City of Glendale Transportation Plan, June 2009

The city of Glendale developed a General Transportation Plan in 2009 to understand current conditions and define future transportation improvements. The plan has identified several locations in the Study Area for street improvements. The plan recommends adding one through lane on Thunderbird Road from 67th Avenue to 51st Avenue. The plan also recommends increasing the number of lanes from four to six lanes on 67th Avenue from SR-101L to Deer Valley Road.

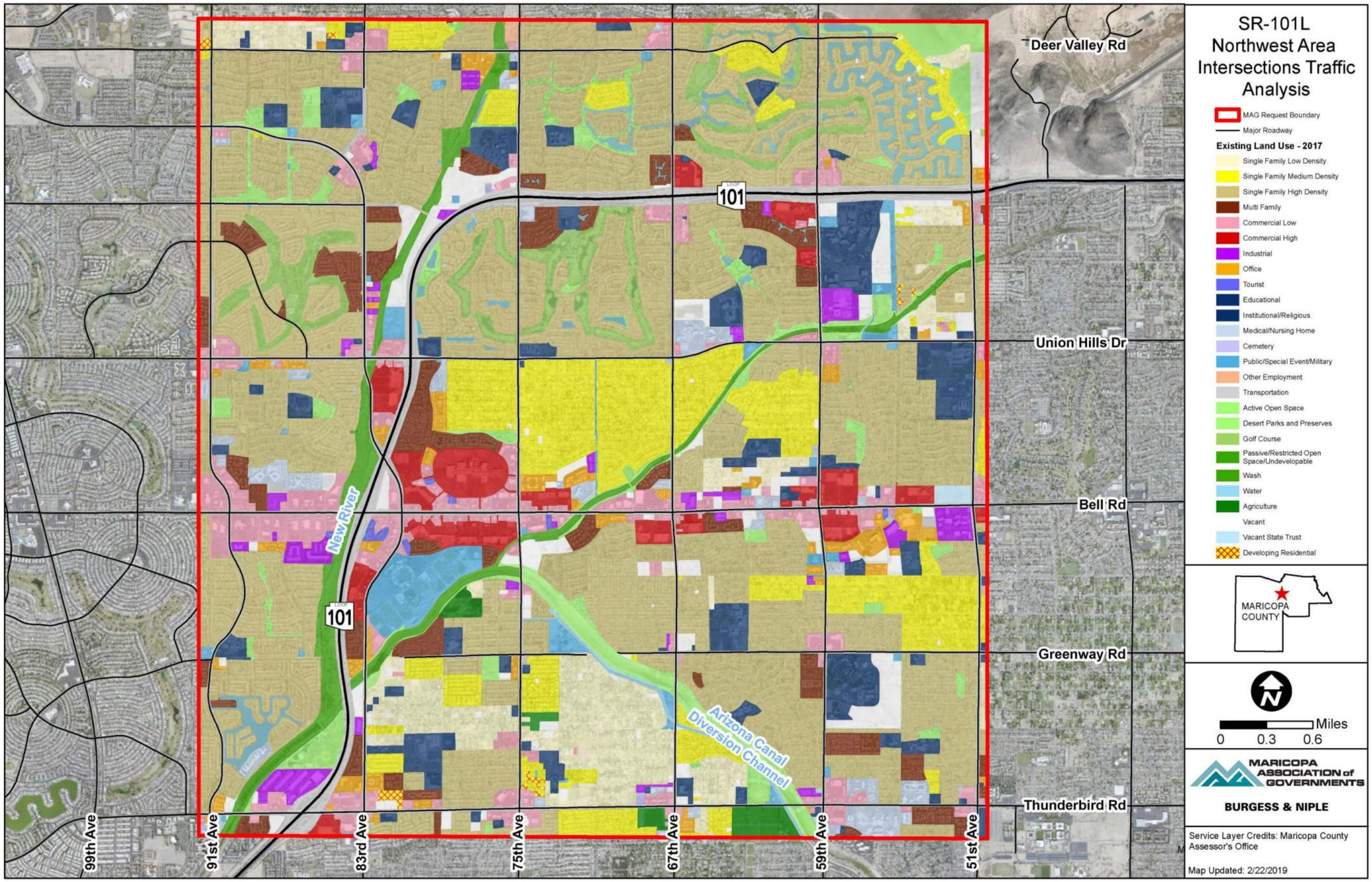
3.0 Land Use

Existing (2018) and future (2040) land use in the Study Area was obtained from MAG to inform trip patterns and mode choice (transit, bicycle, pedestrian, and personal vehicle) decisions. These factors directly influence the operational performance of the Study Area roadway network. Existing Study Area land use, total acreage, and percentage is listed in ***Table 1*** and illustrated in ***Figure 3.1***.

Table 1 – Existing Land Use

Land Use	Total Acres	Percentage
Single Family High Density	6,641	38.22%
Single Family Medium Density	1,679	9.66%
Transportation	1,235	7.11%
Commercial Low	896	5.16%
Single Family Low Density	829	4.77%
Educational	724	4.17%
Multi Family	703	4.04%
Active Open Space	674	3.88%
Vacant	586	3.37%
Commercial High	493	2.84%
Golf Course	485	2.79%
Wash	405	2.33%
Water	315	1.82%
Public/Special Event/Military	312	1.80%
Medical/Nursing Home	296	1.70%
Office	294	1.69%
Industrial	244	1.40%
Religious/Institutional	234	1.35%
Desert Parks and Preserves	113	0.65%
Agriculture	104	0.60%
Passive/Restricted Open Space	37	0.21%
Developing Residential	23	0.13%
Tourist Accommodations	21	0.12%
Vacant State Trust	18	0.10%
Other Employment	8	0.05%
Cemetery	6	0.03%
Total	17,374	100%

Figure 3.1 – Existing Land Use



Single-family residential land use accounts for approximately 53 percent of the Study Area and includes high density (more than four dwelling unit/acre), medium density (one to four du/ac), and low density (less than one du/ac). An additional four percent is multi-family residential, scattered throughout the Study Area.

Commercial land use accounts for approximately eight percent of the Study Area and includes neighborhood and community retail, movie theatres, specialty retail, and regional retail centers. Both low- and high-density commercial land use are focused on Bell Road and near SR-101L. Arrowhead Towne Center is located on Bell Road between 83rd Avenue and 75th Avenue, just east of SR-101L.

Public/Special Event/Open Space use accounts for nine percent of the Study Area and includes the Peoria Sports Complex, located on 83rd Avenue south of Bell Road and east of SR-101L.

There are 22 public schools located within and adjacent to the Study Area: Coyote Hills Elementary School; Sunrise Mountain High School; Frontier Elementary School; Apache Elementary School; Desert Harbor Elementary School; Paseo Verde Elementary School; Centennial High School; Legacy Traditional School; Pioneer Elementary School; Cactus High School; Foothills Elementary School; Greenbriar Elementary School; Arrowhead Elementary School; Highland Lakes School; Sierra Verde Elementary School; Legend Springs Elementary School; Deer Valley High School; Desert Sky Middle School; Challenge Charter School; Desert Heights Charter School; Canyon Elementary School; and Kachina Elementary School.

Three universities are located just outside of the Study Area that have the potential to impact traffic patterns. Midwestern University's Glendale campus is located on the southeast corner of 59th Avenue and SR-101L. The Arizona Christian University is located on the southeast corner of 59th Avenue and Greenway Road. Arizona State University's West Campus is located on the southeast corner of 51st Avenue and Thunderbird Road.

Abrazo Arrowhead Hospital is located just outside of the Study Area, on the northeast corner of Union Hills Drive and 67th Avenue. Similarly, Banner Thunderbird Medical Center is located on the south side of Thunderbird Road between 59th Avenue and 55th Avenue. Both hospitals have the potential to impact traffic patterns and flow within the Study Area.

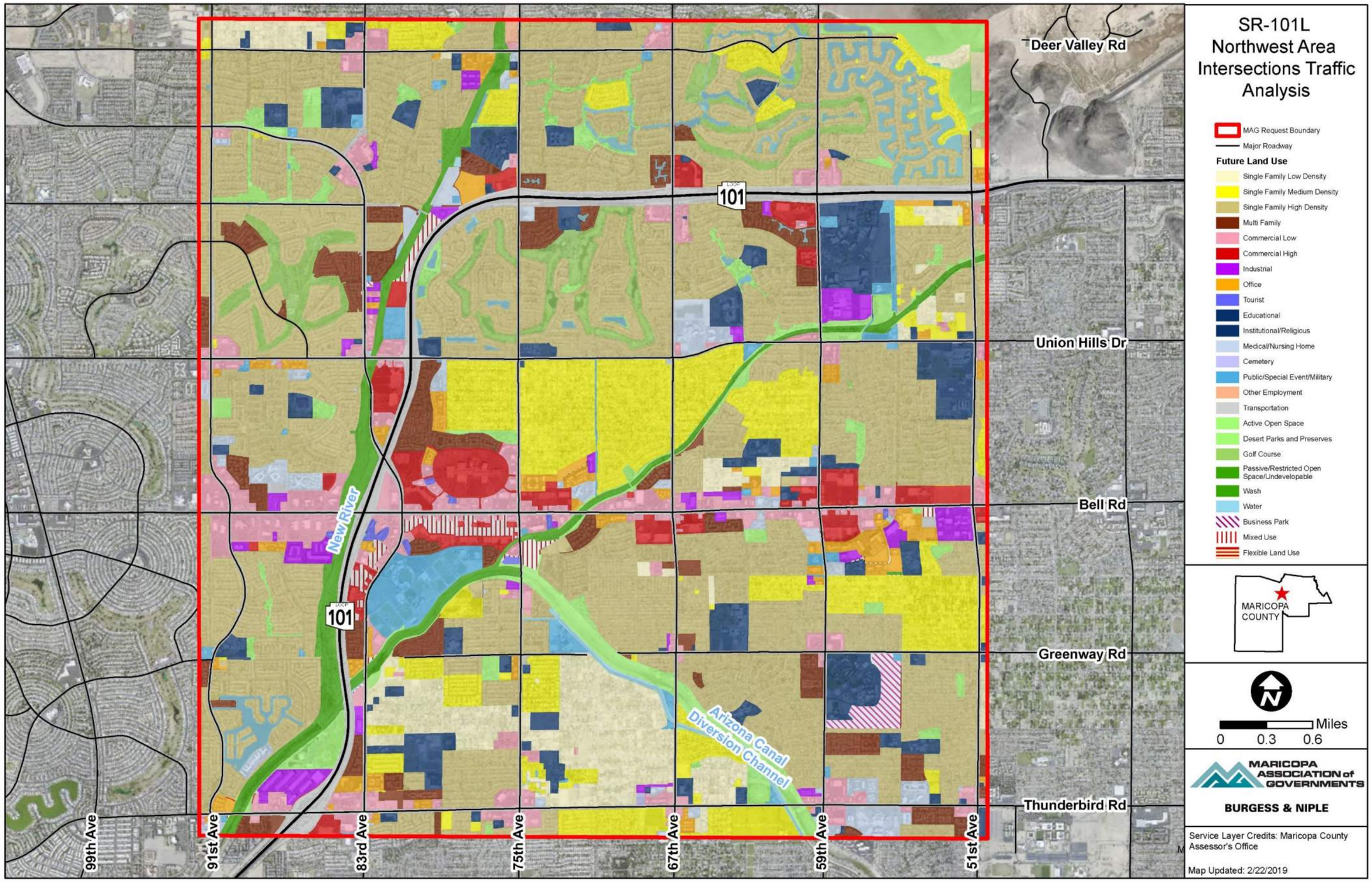
Future land use in the Study Area was obtained from MAG and is not expected to change significantly. ***Table 2*** summarizes the anticipated changes to acreage and

percent of the whole. Vacant and agricultural space is expected to be developed into further residential, commercial, and office spaces. Single family medium density land use is expected to grow from ten percent to eleven percent. Mixed use land space will be introduced and will account for one percent of the total area. ***Figure 3.2*** illustrates the anticipated land uses in 2040.

Table 2 – Future Land Use

Land Use	Total Acres	Percentage	Change in Acreage from Existing (acres)
Single Family High Density	6,675	38.42%	+34
Single Family Medium Density	1,854	10.67%	+175
Transportation	1,238	7.12%	+3
Commercial Low	920	5.29%	+24
Single Family Low Density	884	5.09%	+55
Educational	778	4.48%	+54
Multi Family	750	4.32%	+47
Active Open Space	691	3.97%	+17
Commercial High	505	2.91%	+12
Golf Course	485	2.79%	+0
Wash	400	2.30%	-5
Medical/Nursing Home	351	2.02%	+55
Office	347	1.99%	+53
Water	320	1.84%	+5
Public/Special Event/Military	312	1.80%	+0
Industrial	262	1.51%	+18
Religious/Institutional	235	1.35%	+1
Desert Parks and Preserves	113	0.65%	+0
Mixed Land Use	110	0.63%	+110
Business Park	68	0.39%	+68
Passive/Restricted Open Space	39	0.22%	+2
Tourist Accommodations	25	0.14%	+4
Other Employment	8	0.05%	+0
Cemetery	4	0.02%	-2
Total	17,372	100%	

Figure 3.2 – Future Land Use



4.0 Existing and Future Transportation Network

4.1 Existing Network

The existing (2018) transportation network for the Study Area is shown in ***Figure 4.1***. This is the network upon which all existing conditions models developed for this Study are based. The network is color-coded by the number of through lanes. Signalized intersections along Bell Road that were assessed as part of this Study are indicated on the figure.

4.2 Future Network

There are two main modifications to the existing transportation network within the Study Area expected by 2040 which significantly impact the traffic analysis conducted for this Study. They are:

- An additional general-purpose (GP) lane on SR-101L; and
- Additional ramp metering on SR-101L entrance ramps.

These modifications were included in the future year micro- and macrosimulation models, discussed in ***Sections 6.1.5*** and ***6.1.6***, respectively.

4.3 Access

Future Study Area actions may consider access management policies and access revisions near SR-101L TIs and Bell Road.

Access points were documented within 1,500 feet of the ramp terminals for SR-101L TIs within the Study Area. The points are shown in ***Figure 4.2***. Both driveways and intersecting minor roads are included. For access control near interchanges, ADOT provides the following guidance in its Roadway Design Guidelines:

> *"Full access control shall extend along the crossroad a minimum of 660 ft beyond the end of exit ramp radius returns. From entrance ramps, full access control shall extend along the crossroad a minimum of 330 ft beyond the radius return. Between 330 ft and 660 ft from the entrance ramp returns, access along the crossroad shall be limited to right-in / right-out only."*

All Study Area TIs do not conform with the ADOT Roadway Design Guidelines for access control guidance.

There are numerous access points on Bell Road within the Study Area extents. The access points include commercial-access driveways and unsignalized three- and four-way intersections. There are no driveway access points that lead directly to a residence along Bell Road. ***Figure 4.3*** shows the access points on Bell Road from 92nd Avenue to 59th Avenue.

In total, there are 98 access points within the approximately four-mile stretch and nearly 24 access points per mile. The number of access points per mile is one of many factors which may be considered for access management along a corridor, including access type, spacing, and proximity to other elements of the roadway network. It is up to the local jurisdiction to decide the access management policies that best suit its needs and what an acceptable access point density is for a facility. In general, numerous access points along a corridor can diminish a corridor's overall operations and, according to the TRB Access Management Manual (2014), crash frequency increases as access point density increases. For urban and suburban areas, the TRB Access Management Manual provides research indicating the crash rate for corridors with over 20 access points per mile is almost double the crash rate for corridors with less than 20 access points per mile. As noted above, the Bell Road study corridor has approximately 24 access points per mile.

Figure 4.1 – Existing Transportation Network

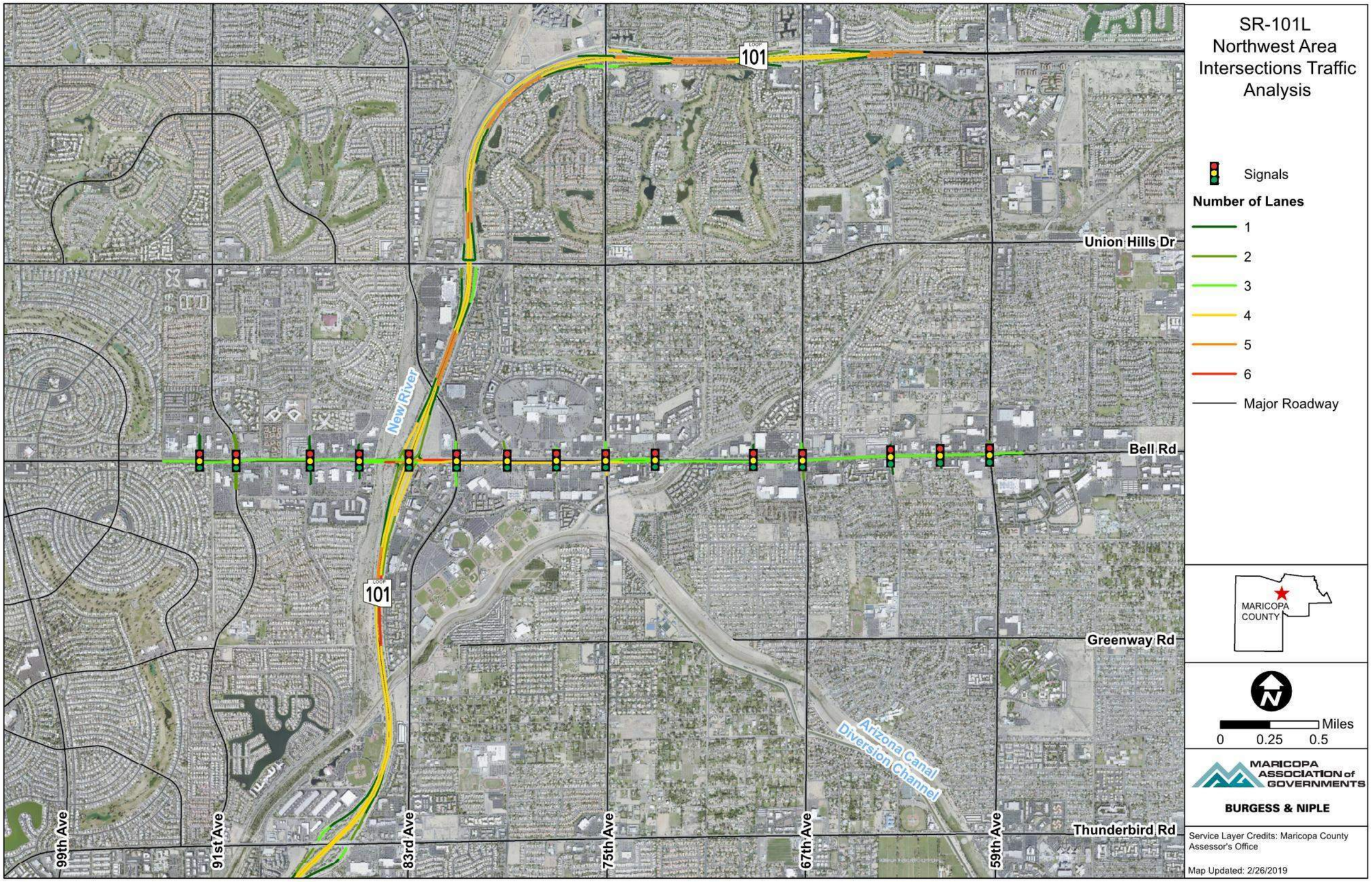


Figure 4.2—SR-101L TIs: Access Points

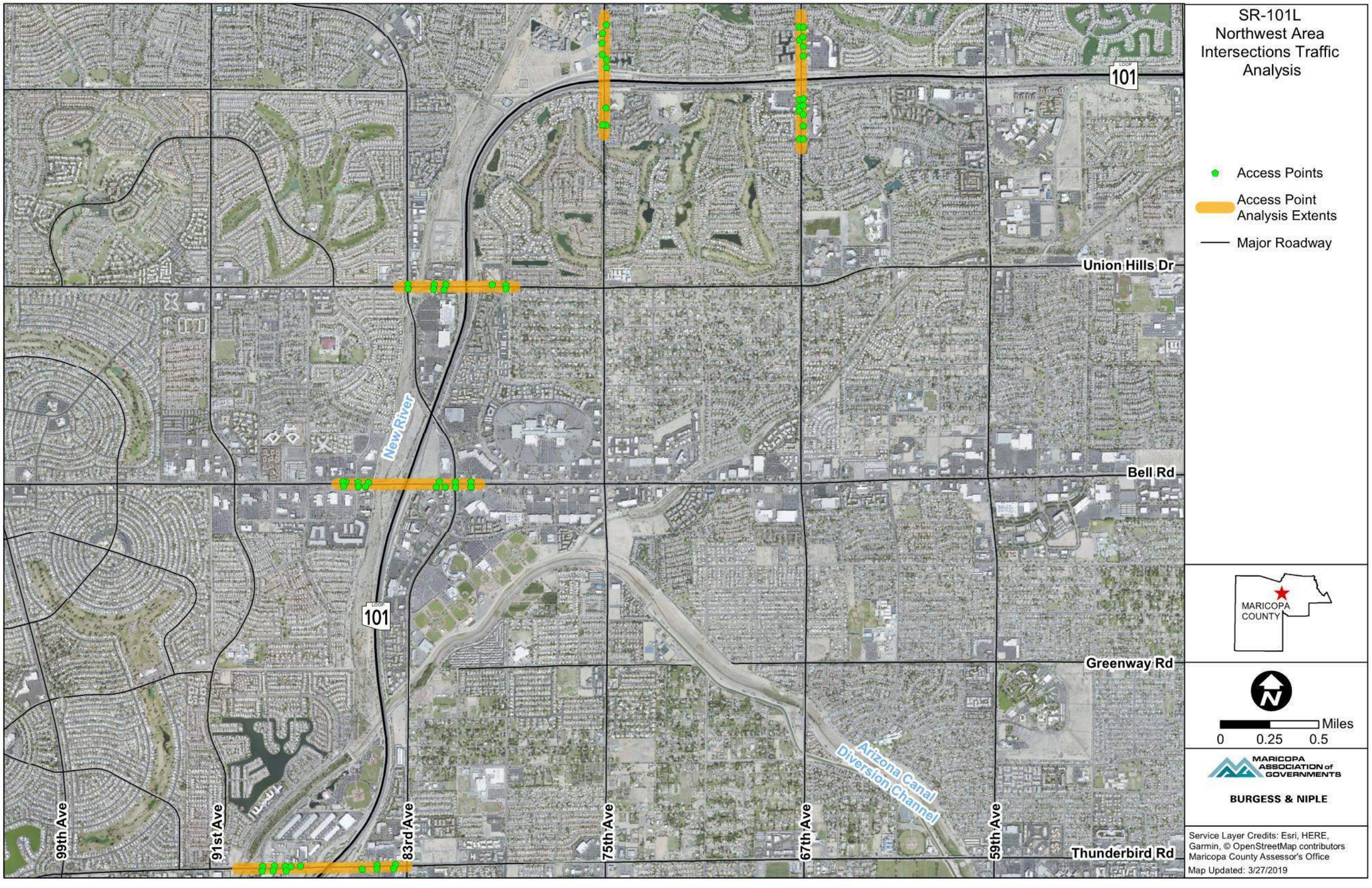
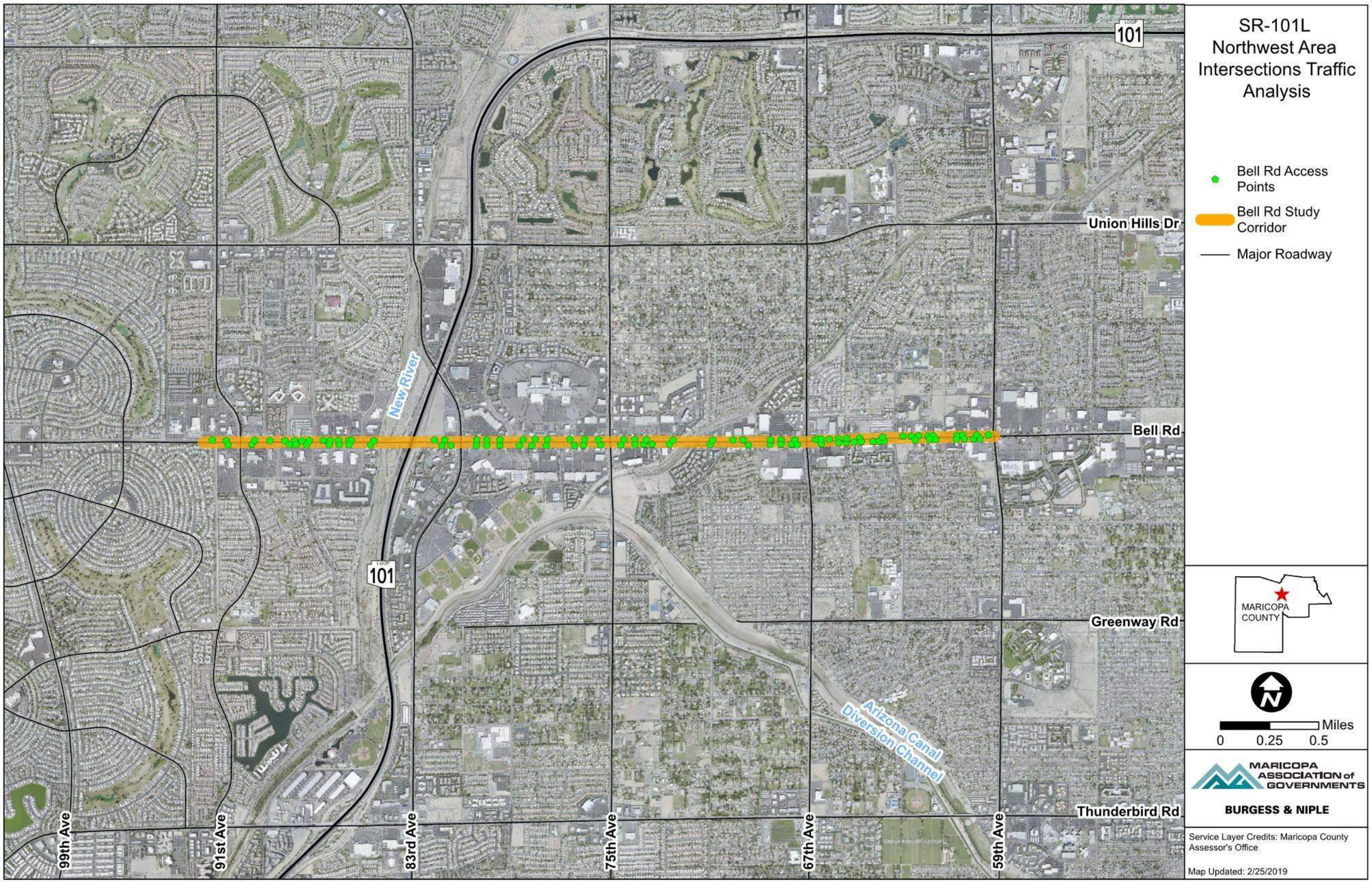


Figure 4.3 – Bell Road: Study Area Access Points



4.4 Traffic Volume

4.4.1 Existing Turning Movement Counts

Turning movement counts were collected in the Study Area for the five TIs along SR-101L and eight signalized intersections on Bell Road. Some counts were collected specifically for this study; additional counts (2015 or more recent) were provided by the city of Glendale as available. Counts collected specifically for this study were collected on November 13, 2018, during the a.m. and p.m. peak hours, a date expected to exhibit "typical" travel patterns for the Study Area. Area schools and universities were in session on this day. Counts were provided by the city of Glendale at the following locations:

- SR-101L and 75th Avenue (2016);
- SR-101L and 67th Avenue (2016);
- Bell Road and 75th Avenue (2016);
- Bell Road and 67th Avenue (2015); and
- Bell Road and 59th Avenue (2016).

For counts taken between 2015 and 2018, the count was grown by two percent per year to produce 2018 volumes. At location where counts were unavailable, turning movement volumes were estimated using modeling techniques discussed in ***Section 6.1.6***. Existing turning movement volumes were estimated for the following intersections:

- Bell Road and 91st Avenue;
- Bell Road and 84th Avenue;
- Bell Road and 73rd Avenue;
- Bell Road and 69th Avenue; and
- Bell Road and 63rd Avenue.

Traffic count data collected in conjunction with this Study is included in ***Appendix A***. ***Figure 4.4*** shows numbered intersections for SR-101L and Bell Road within the extents of the Study Area. ***Figure 4.5*** and ***Figure 4.6*** show the existing turning movement counts for SR-101L and Bell Road at the numbered intersections, respectively. Locations at which counts were estimated are not shown.

4.4.2 Future Turning Movement Counts

Future (2040) turning movement counts were developed using forecasting methodology presented in the National Cooperative Highway Research Project's (NCHRP) 765 Report: Analytical Travel Forecasting Approaches for Project-Level Planning and Design, discussed in ***Section 6.1.2***. ***Figure 4.7*** and ***Figure 4.8*** present future 2040 turning movement counts for the same locations shown in ***Figure 4.5*** and ***Figure 4.6***.

Figure 4.4 – Turning Movement Count Map

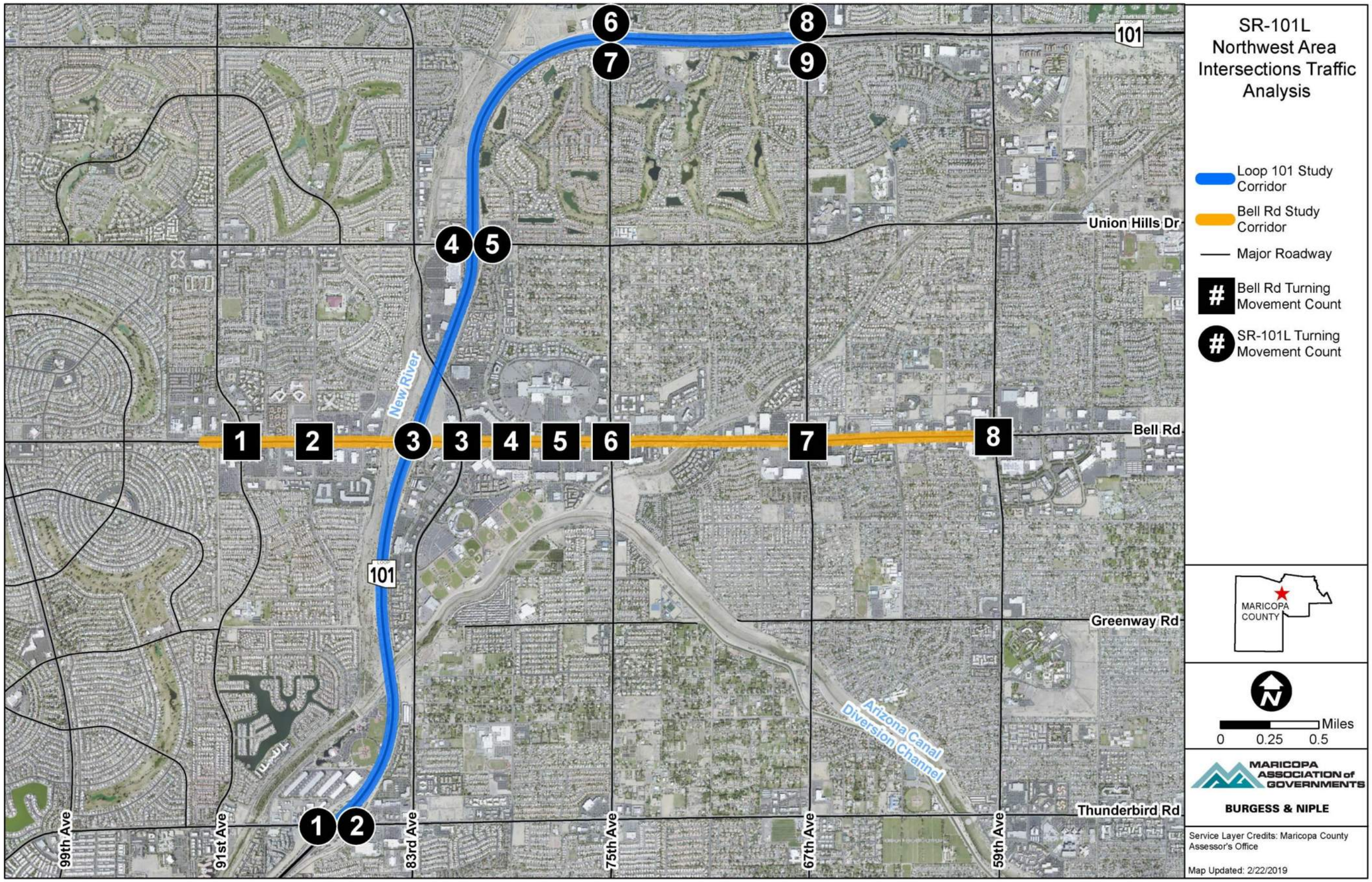


Figure 4.5 – SR-101L Existing Turning Movement Counts

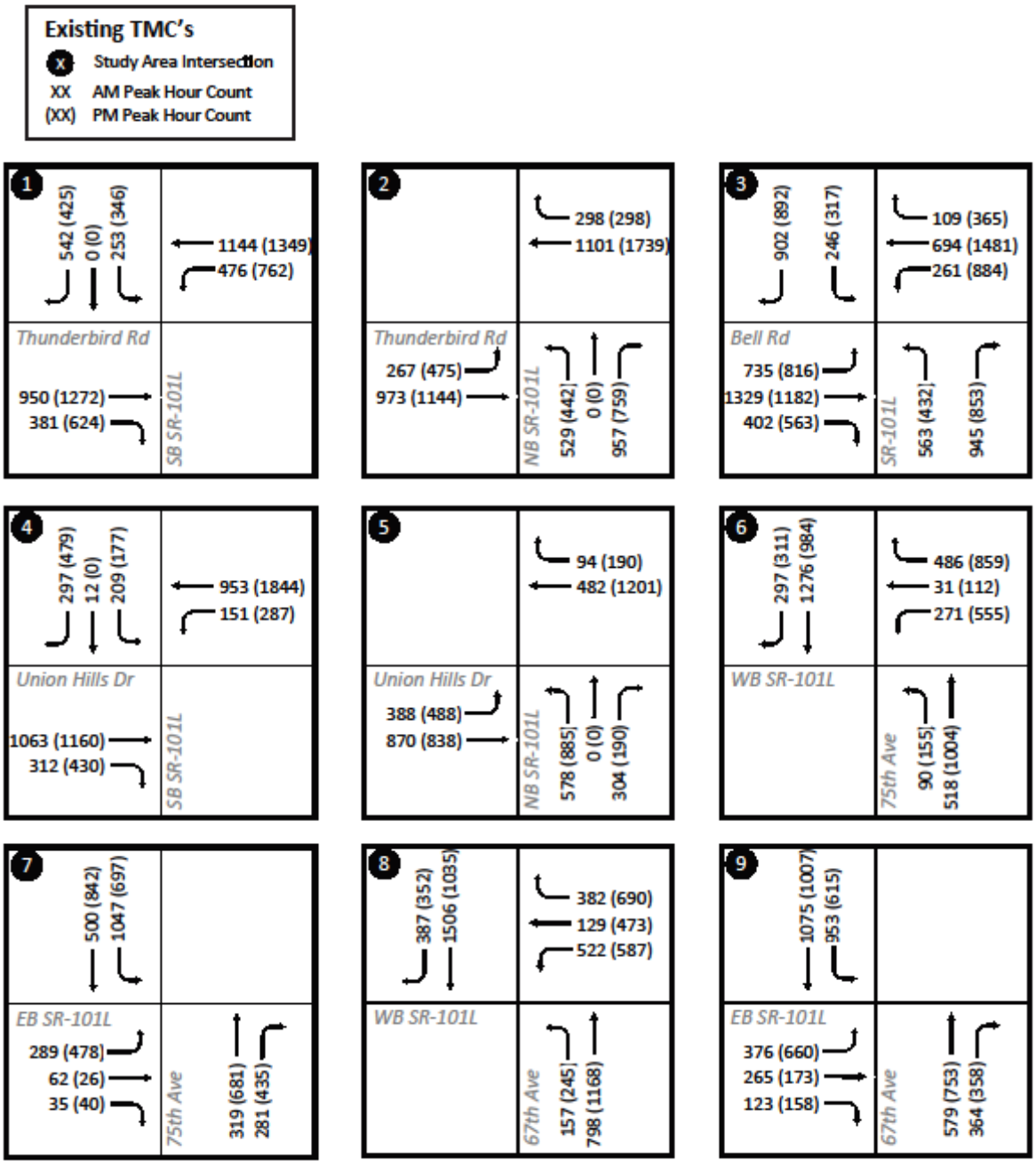


Figure 4.6 – Bell Road Existing Turning Movement Counts

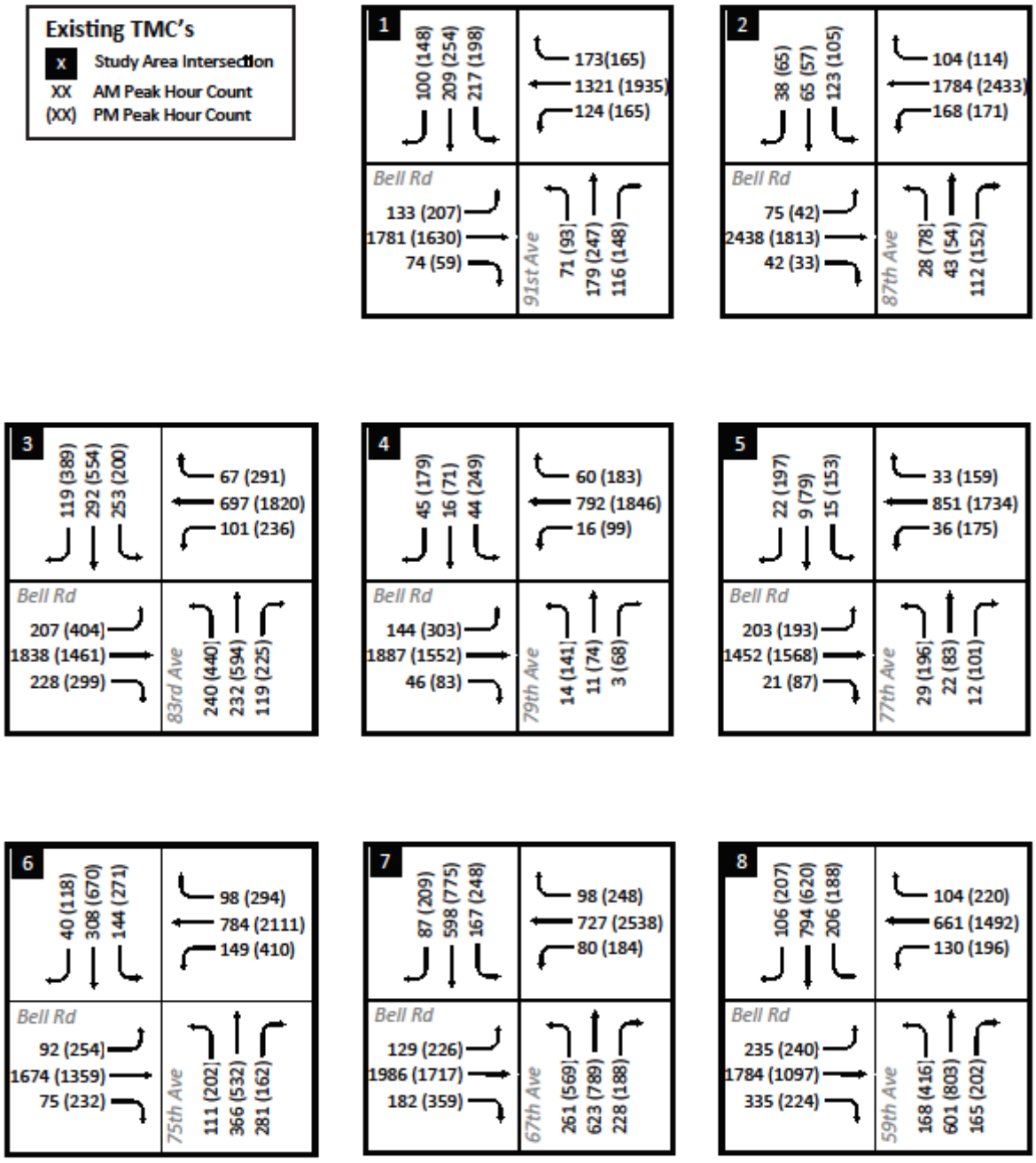


Figure 4.7 – SR-101L Future Turning Movement Counts

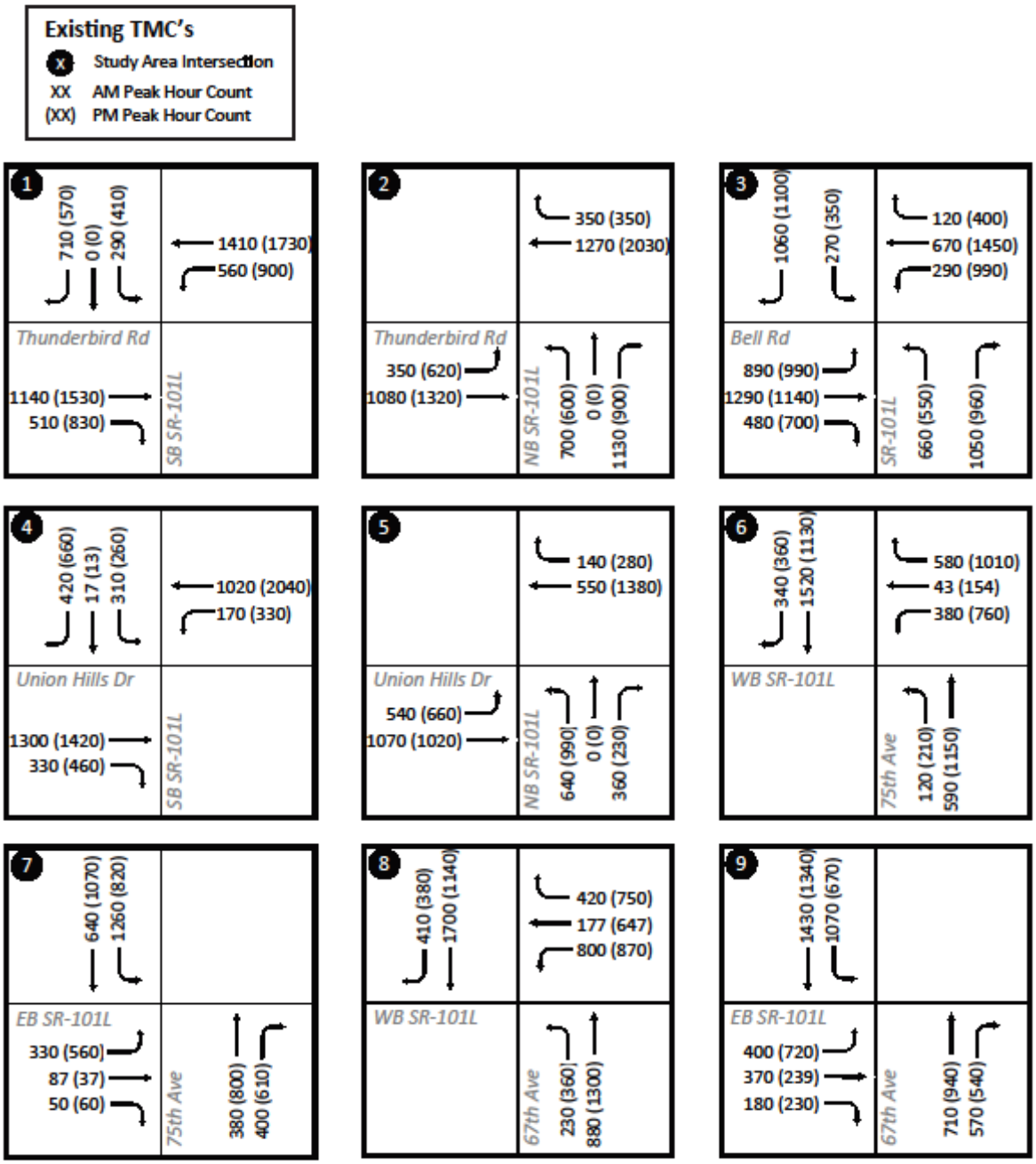
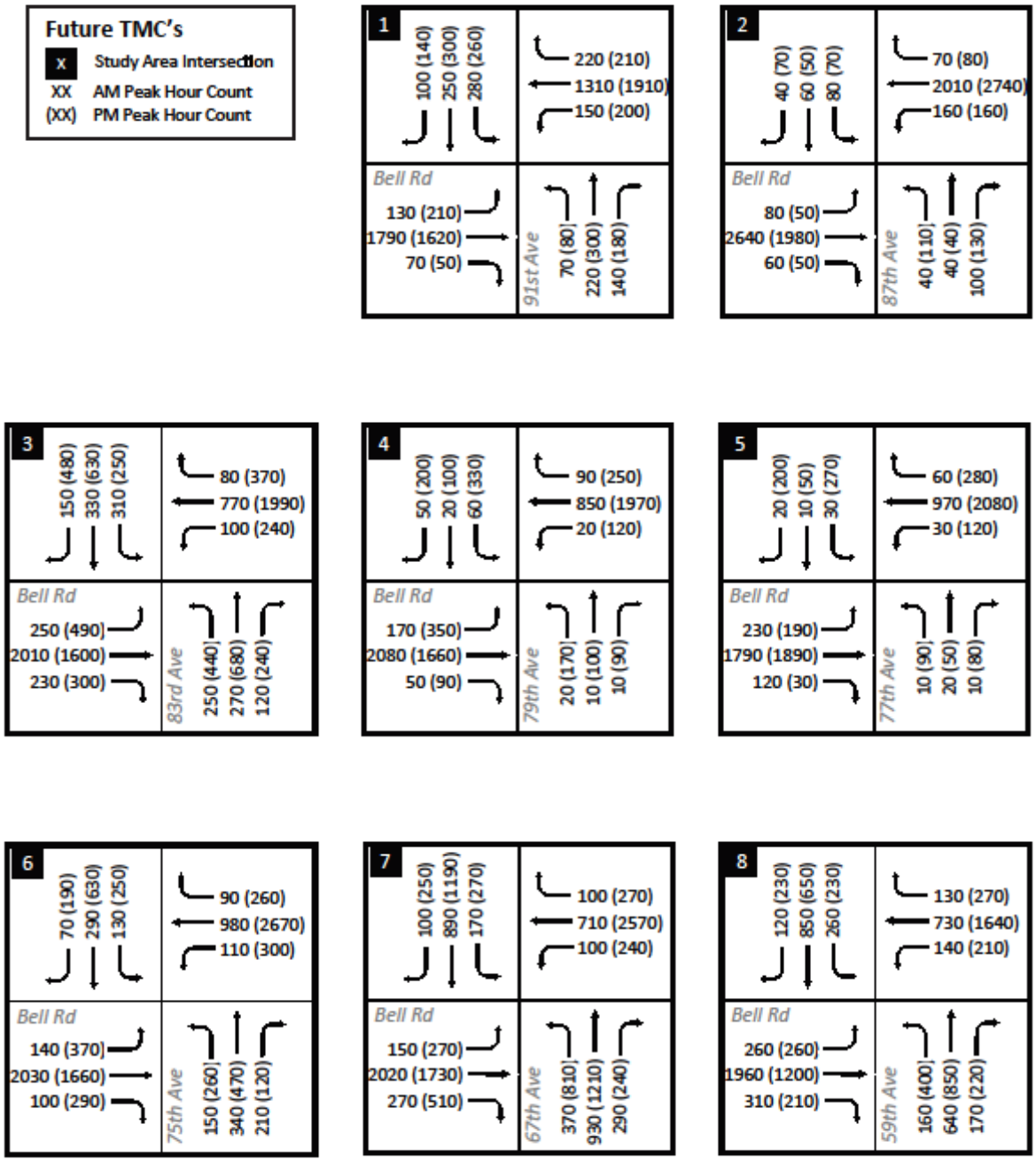


Figure 4.8 – Bell Road Future Turning Movement Counts



4.4.3 Existing and Future ADT

The most recent available Average Daily Traffic (ADT) for arterials in the Study Area were collected from exhibits on the City of Glendale and City of Peoria websites. These exhibits are provided in ***Appendix B***. The counts provided on these exhibits were collected between 2015 and 2017. Depending on the associated date, counts were grown by two percent per year to estimate a 2018 count. ADT was collected for SR-101L and SR-101L ramps using ADOT's online Traffic Data Management System (TDMS) web mapping application. Mainline ADTs were calculated from 24-hour ramp volume counts and the 24-hour mainline count from Tuesday, November 14, 2017, at a continuous count station (Station ID: 101216) between the Thunderbird Road and Bell Road TIs. Future ADT was developed using NCHRP 765 traffic forecasting methodology described in ***Section 6.1.2***. ***Figure 4.9*** shows existing and future ADT along Bell Road and the SR-101L mainline throughout the Study Area. Existing volumes are represented in black and future volumes in red.

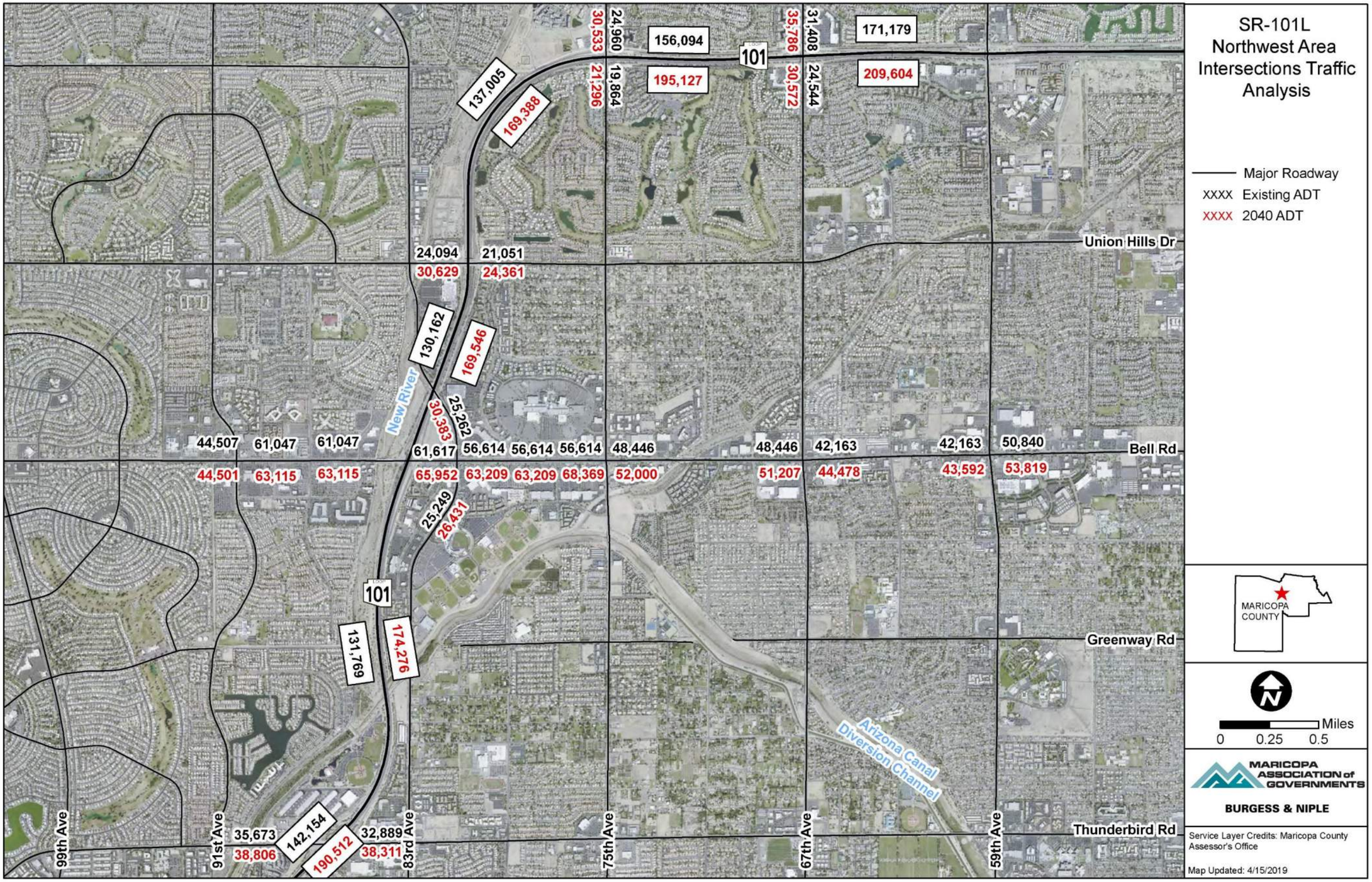
Traffic volumes along Bell Road are the highest nearest the SR-101L and Bell Road TI (between 60- and 70,000 vehicles per day). East and west of the Bell Road TI, ADT along Bell Road is between 40- and 50,000 vehicles per day. Between 2018 and 2040, the most growth along Bell Road is expected in the vicinity of the Arrowhead Town Center (12 percent). Expected growth is approximately six percent east of Arrowhead Town Center and less west of the Bell Road/SR-101L TI.

Traffic volumes along the mainline SR-101L are highest east of the 67th Avenue/SR-101L TI (approx. 162,000 veh/day) and south of the Thunderbird Road TI (approx. 142,000 veh/day). Between 2018 and 2040, traffic demand on SR-101L within the Study Area is expected to grow between 22 and 34 percent. The most growth is expected nearest the Thunderbird Road TI (34 percent), while the least growth is expected east of the 67th Avenue TI (22 percent).

4.5 Traffic Signal Timing Plans

Traffic signal timing plans and phasing diagrams were provided for all Study Area TIs by ADOT and are available upon request. Existing timing plans were used to model existing conditions for the TIs. Signal timing was optimized for intersections along Bell Road to model the operations of Bell Road's adaptive signal control system, Rhythm In|Sync. This analysis is discussed in more detail in ***Section 6.1.3***.

Figure 4.9 – Existing and Future ADT



5.0 Safety

Crash data for the five-year period from January 1, 2013, through December 31, 2017, was provided by MAG and the city of Glendale from the MAG Regional Transportation Safety Information Management System (RTSIMS) database to assess safety in the Study Area. Safety was assessed for SR-101L TIs, for SR-101L mainline segments, and for intersections along Bell Road in ***Sections 5.1, 5.2*** and ***5.3***, respectively. ***Figure 5.1*** shows a crash heat map for SR-101L and the number of crashes by intersection for Bell Road.

Unless otherwise noted, MAG provided crash data is presented in the following tables. Alternate crash data provided by the city of Glendale is available in ***Appendix D***. Of the provided crash data, the highlighted records are pertinent to this Study.

5.1 SR-101L TI Safety Analysis

Crashes were analyzed for each SR-101L TI within the Study Area. ***Table 3*** summarizes crashes at each TI by Injury Severity and ***Table 4*** summarizes crashes at each TI by collision manner. Crash data for the TIs was provided by MAG following MAG's standard export procedures for the specified five-year time period. Crash data for the 75th Avenue and 67th Avenue TIs was also provided by the city of Glendale to verify crash information. Following review and coordination between both agencies, the datasets provided by the city of Glendale were utilized in the analysis. They are marked accordingly in ***Table 3*** and ***Table 4***.

Table 3 – SR-101L TIs: Injury Severity by TI

SR-101L TI	Fatal	Incapacitating	Non-incapacitating Injury	Possible Injury	No Injury	Total
Thunderbird Road	0	4	5	12	54	75
Bell Road	0	5	7	16	96	124
Union Hills Drive	0	0	7	12	63	82
75th Avenue[1]	0	3	3	13	73	92
67th Avenue[1]	0	1	9	26	121	157
[1]Crash data provided by City of Glendale						

The 67th Avenue TI had the most crashes of all TIs in the Study Area, followed by the Bell Road TI. There were no fatal crashes at any of the intersections during the five-year period; however, all but the Union Hills Drive TI had at least one incapacitating crash.

Table 4 summarizes the crashes at each TI by collision manner. For all TIs in the Study Area, rear end was the dominant collision manner. The 67th Avenue TI had the most angle, left-turn, rear end, and same-direction sideswipe crashes of all TIs. The Bell Road TI had the most rear end and single vehicle crashes.

Figure 5.1 – Crash Map

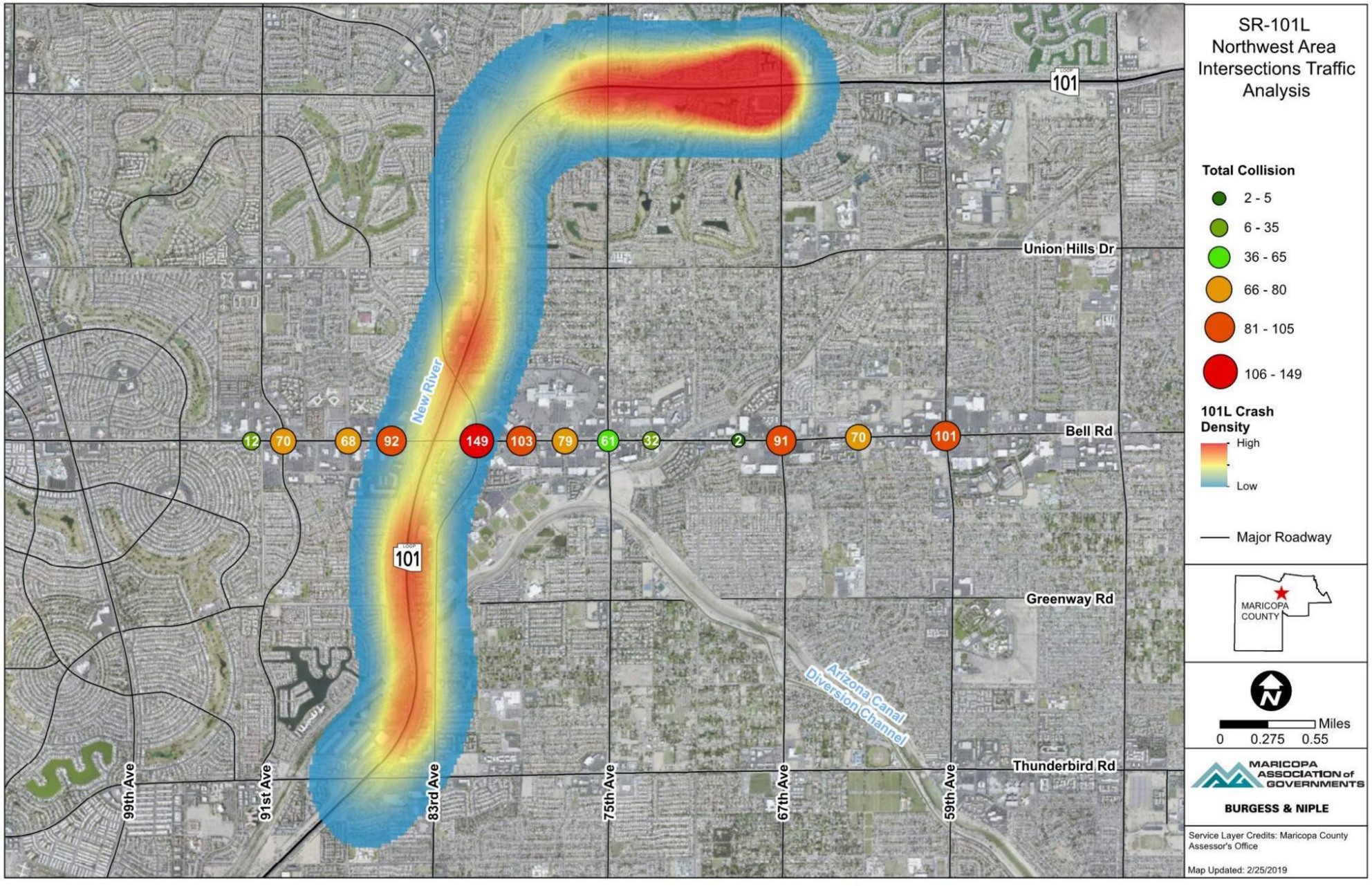


Table 4 – SR-101L TIs Collision Manner by TI

TI	Collision Manner													
	Single Vehicle	Angle	Left-Turn	Rear End	Head On	Sideswipe (Same Direction)	Sideswipe (Opposite Direction)	Rear to Side	Rear to Rear	Pedestrian	Bicycle	Other*	Unknown	Total
Thunderbird Rd & SR-101L	4	7	21	28	2	10	1			1		1		75
Bell Rd & SR-101L	16	14	8	60		23						3		124
Union Hills Dr & SR-101L	4	20	13	33	1	10	1							82
75th Ave & SR-101L[1]	13	5	12	49		10				1	1	1		92
67th Ave & SR-101L[1]	3	42	23	59		27	1			1		2		157

**Does not include pedestrian or bicycle crashes.*

5.2 SR-101L Mainline Safety Analysis

Within the five-year period, 1,118 crashes occurred on SR-101L mainline segments within the Study Area. Of those, 4 were fatal and 20 were incapacitating. ***Table 5*** lists the crashes by injury severity along SR-101L segments, listed from south to north. Segments listed as "Thunderbird Rd", for example, refer to the mainline segment between the on and off ramps serving that arterial—in this case, Thunderbird Road.

Table 5 – SR-101L: Injury Severity by Segment

Segment	Fatal	Incapacitating	Non-incapacitating Injury	Possible Injury	No Injury	Total
Thunderbird Rd	0	3	15	17	71	106
Thunderbird Rd to Bell Rd	2	5	30	18	142	197
Bell Rd	0	0	5	10	50	65
Bell Rd to Union Hills Dr	0	2	8	7	43	60
Union Hills Dr	0	1	11	6	41	59
Union Hills Dr to 75th Ave	1	1	6	8	47	63
75th Ave	0	3	19	19	86	127
75th Ave to 67th Ave	0	1	13	11	66	91
67th Ave	1	4	38	52	255	350
Total	4	20	145	148	801	1118

Over the five-year period, two fatalities occurred between Thunderbird Road and Bell Road, one fatality occurred between Union Hills Drive and 75th Avenue, and one fatality occurred between the 67th Avenue on and off ramp gores. 67th Avenue experienced the most crashes overall within the Study Area, but the segment between Thunderbird Road and Bell Road experienced the most incapacitating crashes. ***Table 6*** lists SR-101L Study Area segments by collision manner.

Table 6 – SR-101L Mainline Collision Manner by Segment

Segment	Collision Manner													
	Single Vehicle	Angle	Left-Turn	Rear End	Head On	Sideswipe (Same Direction)	Sideswipe (Opposite Direction)	Rear to Side	Rear to Rear	Pedestrian	Bicycle	Other*	Unknown	Total
Thunderbird Rd	30	2		48		19						7		106
Thunderbird Rd to Bell Rd	79	4		71		26	1			1		15		197
Bell Rd	33	1		16		11						4		65
Bell Rd to Union Hills Dr	16	2		27		14		1						60
Union Hills Dr	23	2		19		10						5		59
Union Hills Dr to 75th Ave	20	4		18		6						6		63
75th Ave	39	2		68		15		1				2		127
75th Ave to 67th Ave	15			58		14	1	8				2		91
67th Ave	25	3		268	2	43		1				8		350

**Does not include pedestrian or bicycle crashes.*

Rear end crashes accounted for approximately half of all crashes that occurred on SR-101L segments within the Study Area (593 of 1,118 total crashes). The segment between the on and off ramp gores serving 67th Avenue had the highest number of rear end and same-direction sideswipe crashes, crash types typically associated with congestion on freeways. The segment between Thunderbird Road and Bell Road had the most single vehicle crashes, which was the most represented crash type along this segment.

The single pedestrian crash along SR-101L occurred between Thunderbird Road and Bell Road. The crash record did not include any information on the pedestrian activity at the time of the collision.

Table 7 presents crashes along SR-101L listed by fatal or incapacitating injuries and collision manner.

Table 7 – SR-101L: Injury Severity and Collision Manner

Collision Manner	Fatal	Incapacitating
Single Vehicle	3	6
Rear End	1	9
Sideswipe (same direction)	0	4
Other	0	1
Total	4	20

Three of the four fatal crashes occurred in single-vehicle crashes. Nine of the incapacitating crashes were rear end crashes, as well as the fourth fatality. These were the two most common crash types for all SR-101L segments, which is typical for divided highways. Rear end crashes, in particular, tend to be more prevalent along segments with more congestion due to the stop-and-go nature of traffic. This may account for the high number of rear-end crashes on SR-101L between the 67th Avenue on and off ramps.

5.3 Bell Road Intersection Safety Analysis

Within the five-year period, 930 crashes occurred on Bell Road at intersections within the Study Area. Two crashes were fatal; 23 were incapacitating. ***Table 8*** breaks down the crashes at these intersections by injury severity, with intersections listed from west to east.

Table 8 – Bell Road: Injury Severity by Intersection

Intersection	Fatal	Incapacitating	Non-incapacitating Injury	Possible Injury	No Injury	Total
92nd Ave	0	1	0	3	8	12
91st Ave	0	4	15	12	39	70
87th Ave	0	3	10	8	47	68
84th Ave	0	4	7	15	66	92
83rd Ave	0	0	3	28	118	149
79th Ave	0	1	6	29	67	103
77th Ave	0	1	3	23	52	79
75th Ave	1	5	6	12	37	61
73rd Ave	0	0	1	6	25	32
69th Ave	0	0	0	2	0	2
67th Ave	0	1	8	17	65	91
63rd Ave	1	1	4	15	49	70
59th Ave	0	2	6	26	67	101
Total	2	23	69	196	640	930

One fatal crash occurred each at the 75th Avenue and 63rd Avenue intersections within the five-year period. The most incapacitating crashes occurred at 91st Avenue, while the most total crashes occurred at 83rd Avenue. ***Table 9*** lists the crashes at Bell Road Study Area intersections by collision manner.

Per request by the city of Glendale, crash rates were calculated for intersections along Bell Road at which traffic counts were collected. The rates are included as **Appendix E** using crash data provided by the city of Glendale, as available, and MAG data for the remaining intersections. Along Bell Road, the 59th Avenue intersection had the highest crash rate (1.31), followed by 67th Avenue (1.08). 79th Avenue and 83rd Avenue were tied for third highest crash rate (0.94).

Table 9 – Bell Road Collision Manner by Intersection

Intersection	Collision Manner													
	Single Vehicle	Angle	Left-Turn	Rear End	Head On	Sideswipe (Same Direction)	Sideswipe (Opposite Direction)	Rear to Side	Rear to Rear	Pedestrian	Bicycle	Other*	Unknown	Total
92nd Ave	1			11										12
91st Ave	1	6	26	31		3			1			1	1	70
87th Ave		6	7	51		2	1				1			68
84th Ave		12	16	55		9								92
83rd Ave	4	18	18	74	1	30					1	2	1	149
79th Ave	1	11	10	67		12					1		1	103
77th Ave		7	16	50		5					1			79
75th Ave		4	4	35	2	11				2	2			61
73rd Ave	2	4	10	12		4								32
69th Ave	1			1										2
67th Ave	1	12	28	37	1	8				2	1		1	91
63rd Ave	2	11	12	33		8				1	2	1		70
59th Ave	4	14	24	43	1	12				2		1		101

**Does not include pedestrian or bicycle crashes.*

Within the five-year period, rear end crashes accounted for more than half of all crashes that occurred on Bell Road within the Study Area (500 of 930 total crashes). The next most frequent cause of crashes was left-turn crashes, accounting for 171 crashes. The intersection of Bell Road and 83rd Avenue experienced the most crashes of the thirteen intersections in the Study Area (149 crashes), followed by 79th Avenue and 59th (103 and 101 crashes, respectively). 69th Avenue had the least number of crashes, with only 2 crashes over the five-year period. ***Table 10*** summarizes the number of fatal and incapacitating crashes by collision manner.

Table 10 – Bell Road: Injury Severity and Collision Manner

Collision Manner	Fatal	Incapacitating
Angle	2	1
Left-Turn	0	11
Rear End	0	5
Sideswipe (same direction)	0	1
Other	0	1
Pedestrian	0	2
Bicycle	0	2
Total	2	23

Left-turn crashes accounted for the most incapacitating crashes at Bell Road Study Area intersections, followed by rear end crashes. Angle crashes were the cause of both fatal crashes. The number of access points along Bell Road, shown in ***Figure 4.3***, may be a factor contributing to the number of left-turn and angle crashes which have occurred, as drivers attempt to access the businesses against the incoming flow of traffic.

Pedestrian and bicycle crashes tend to be of higher severity than other crash types and are of particular focus in Arizona. ***Table 11*** breaks down the pedestrian and bicyclist crashes along Bell Road by intersection.

Table 11 – Bell Road: Pedestrian and Bicycle Crashes by Severity and Intersection

Intersection	Fatal	Incapacitating	Non-incapacitating Injury	Possible Injury	No Injury	Total
92nd Ave	0	0	0	0	0	0
91st Ave	0	0	0	0	0	0
87th Ave	0	0	1	0	0	1
84th Ave	0	0	0	0	0	0
83rd Ave	0	0	0	1	0	1
79th Ave	0	0	0	1	0	1
77th Ave	0	0	0	0	1	1
75th Ave	0	4	0	0	0	4
73rd Ave	0	0	0	0	0	0
69th Ave	0	0	0	0	0	0
67th Ave	0	0	1	2	0	3
63rd Ave	0	0	0	2	1	3
59th Ave	0	0	0	2	1	3
Total	0	4	2	8	3	17

There were no fatal pedestrian or bicycle-related crashes on Bell Road in the Study Area over the five-year period. However, there were four incapacitating pedestrian or bicycle-related crashes. Of the 17 pedestrian- and bicycle-related crashes, 11 occurred in daylight conditions. The most pedestrian- or bicycle-related crashes occurred at 75th Avenue; all were incapacitating and all occurred in the daytime. 75th Avenue is located at the east side of the Arrowhead Towne Center mall, bordered on all sides by restaurants and large stores. 83rd Avenue, 79th Avenue, and 77th Avenue are also adjacent to the Arrowhead Towne Center complex; each had one pedestrian or bicycle crash during the five-year period.

67th Avenue, 63rd Avenue, and 59th Avenue had the second-most bicycle and pedestrian crashes, with three crashes each. The 59th Avenue intersection is surrounded by commercial properties, which are part of the Talavi Town Center. The 67th Avenue intersection is surrounded by commercial properties on a more limited scale than 59th Avenue, including a bank and grocery store, bordered closely by residential neighborhoods. 63rd Avenue is surrounded by a mix of smaller commercial properties, including two auto repair centers, and residential communities.

6.0 Existing and Future Traffic Analysis

An existing (2018) and future (2040) no-build conditions analysis was performed for the Study Area using a combination of modeling techniques. Synchro software was used to assess the operations of the Study Area intersections along Bell Road and the SR-101L TIs, including the Bell Road SPUI. PTV Vissim and Visum software was used to develop micro- and macrosimulation models for the Study Area, respectively. The models played an important role towards providing a complete description of traffic patterns within the Study Area for existing and future years, including estimating counts at intersections for which count data was not available and assessing intersection and segment operations. The analysis methodology, models, and results of the analysis are described below.

6.1 Methodology

MAG data was obtained for the Study Area for existing (2018) and future year (2040) scenarios. The data provided the existing and future ADT volumes for traffic forecasting, a process which provides calibrated future ADT volumes and turning movement counts for the peak a.m. and p.m. periods. Preliminary Origin-Destination (OD) matrices were developed for a.m. and p.m., existing and future time periods using existing and forecasted turning movement counts.

A microscopic model of the Study Area network was constructed using PTV Vissim software. This model was imported into the macroscopic modeling platform, Visum, and calibrated for existing and future scenarios using existing and forecasted turning movement counts and preliminary OD matrices through a process known as matrix estimation. The macroscopic model was used to: 1) Generate turning movement volumes at locations without traffic count information for both existing and future year scenarios and 2) Refine existing and future OD matrices. Turning movement volumes were exported to Synchro for a Level of Service (LOS) analysis of Study Area SR-101L TIs and intersections. Calibrated OD matrices were imported into the microscopic model for further assessment of segment, intersection, and network-wide operations. The microscopic model was verified and supplemented with a high-level Highway Capacity Software (HCS) analysis. Each model is discussed in more detail in the following sections.

6.1.1 MAG Travel Demand Model

The MAG Travel Demand Model (TDM) was a critical tool to this Study for the development of future ADT projections and refined future turning volumes. The MAG TDM is a regional 4-step model maintained by MAG and developed using TransCAD modeling software. The Study Area lies completely within the MAG TDM.

A TDM is often referred to as a "regional" model because the roadway network it represents typically spans multiple jurisdictions. TDMs are extensively calibrated and rooted in survey-informed population, employment, and socioeconomic data—all of which influence trip generation and mode choice. The MAG model has a land use component that includes socioeconomic information in the region disaggregated by TAZ. Each TAZ in the region includes information about housing, population and employment. Land use estimates for the future are generally derived from Census data and regional estimates associated with improvements. To develop the future year land use data, MAG utilizes the land use elements of adopted general/comprehensive plans for cities and towns in the region. Future year MAG models also include programmed and funded roadway improvements in the region. Therefore, model traffic projections account for planned improvements, new developments, and land use changes expected by a specified horizon year.

6.1.2 Traffic Forecasting

Future ADT and turning movement volumes for the Study Area were projected using forecasting methodology presented in NCHRP 765 Report: Analytical Travel Forecasting Approaches for Project-Level Planning and Design. The report and procedures outlined in the NCHRP 765 report largely derive from and improve upon the procedures outlined in a prior NCHRP publication, Report 255: Highway Traffic Data for Urbanized Planning and Design. The specific procedure used in the current study is an iterative turning movement estimation method and uses the combined Factoring Procedures for Ratio and Difference Methods in the NCHRP 765 Report.

The inputs required for post-processing model estimates using this method are:

1. Base year traffic counts;
2. Base year regional TDM estimates;
3. Future year regional TDM forecasts; and
4. Design hour 30th highest K-factor.

The procedure adjusts the model forecasted link volumes using a combination of Ratio and Difference Methods and subsequently uses an iterative method to determine future turning movement volumes using existing turning movement counts as a basis. A tolerance of 10 percent was used to determine the convergence of the iterative method. The iterative process is designed to minimize the errors identified in the existing year model estimates when compared to the observed traffic counts.

6.1.3 Synchro Model

A Synchro (Version 10.0) model was developed to provide a LOS analysis of Study Area intersections along Bell Road and Study Area TIs along SR-101L. The following sections discuss the LOS analysis process and the factors that determine LOS.

Level of Service Analysis

LOS is a qualitative measure of how well an intersection or roadway segment operates on a graded scale of A (best) to F (worst). LOS considers a variety of factors, including stability of traffic flow, opportunity for passing, and driver comfort. Operations of LOS D and better are typically considered acceptable in urban settings. Operations of LOS E or F may be flagged for improvement.

For intersection and TI analysis, LOS is determined using the total delay, in seconds, of vehicles which approach the intersection over the course of one traffic signal cycle. Intersections within the Study Area were analyzed using the LOS thresholds shown in ***Table 12***.

Table 12 – LOS Thresholds for Signalized Intersections

Control Delay	Level of Service
≤ 10 seconds	A
10 – 20 seconds	B
20 – 35 seconds	C
35 – 55 seconds	D
55 – 80 seconds	E
> 80 seconds	F

The LOS analysis was conducted using Synchro's built-in methodology. While Highway Capacity Manual (HCM) 6th edition methodology is most commonly used to assess intersection LOS, it cannot assess intersections with unique signal timing and geometric configurations. Specifically, HCM 6th edition methodology cannot assess TIs modeled as clustered intersections. Synchro was used to for TIs as it accounts for the combined operation and close proximity of ramp terminals. For consistency, all results presented in this report were generated using Synchro's built-in methodology.

Intersection Geometry

Lane configuration, the number of lanes allocated to through and turning movements for each intersection approach, is one key determinant of intersection LOS. The existing conditions Synchro model for the Bell Road Study Area intersections was developed using aerial imagery. The lane configuration of each intersection in the existing

conditions Synchro model matches the lane configuration of each intersection. Lane configurations for the future analysis match those of the existing conditions analysis, representing a "future no-build" condition.

Traffic Volumes

The Synchro models developed for the a.m. and p.m. existing condition scenarios use actual count volumes where available. For future condition scenarios, locations at which counts were collected use traffic volumes forecasted directly from the counts, projected using NCHRP 765 methodology. At the remaining locations, the existing and future Synchro models use counts developed with the modeling techniques described in ***Section 6.1.6***. Truck percentages and peak hour factor were modeled as two percent and 0.92, respectively.

Traffic Signal Timing

All intersections within the Study Area were analyzed as actuated-coordinated intersections. For existing conditions, Study Area TIs along SR-101L were timed in Synchro using the signal timing plans and phasing diagrams provided by ADOT.

Study Area intersections along Bell Road were optimized as an approximation of the unique adaptive signal system, Rhythm In|Sync, currently implemented along the Bell Road corridor. The Rhythm software is proprietary and the necessary information to construct a full-scale microsimulation model to assess the operations of the Bell Road adaptive signal system was not available. Synchro optimization represents an acceptable alternative for assessing the operations of intersections along Bell Road.

To approximate operations along Bell Road, signals were optimized to use cycle lengths between 90 and 120 seconds and incorporated pedestrian phasing, where reasonable. Red and yellow intervals were calculated based on the posted speed limit and geometric configuration of each intersection. Signals were coordinated based on existing splits, assuming coordination along Bell Road.

All signals, including those at TIs along SR-101L, were optimized for future conditions scenarios. For SR-101L TIs, a separate Synchro analysis was performed to assess operations using existing timings with future volumes. This is discussed further in ***Section 6.3.1***.

In the future condition, signal optimization at the TIs was performed following a similar process to that used for existing conditions along Bell Road. However, the TIs were optimized as isolated intersections and not as part of a network. Optimizing a TI as an isolated intersection does not capture the effects of metering, queue spillback and

corridor progression on signal operations at the TI—effects which can significantly impact operations. The analysis of the TIs as part of a larger network, however, was beyond the scope of this project.

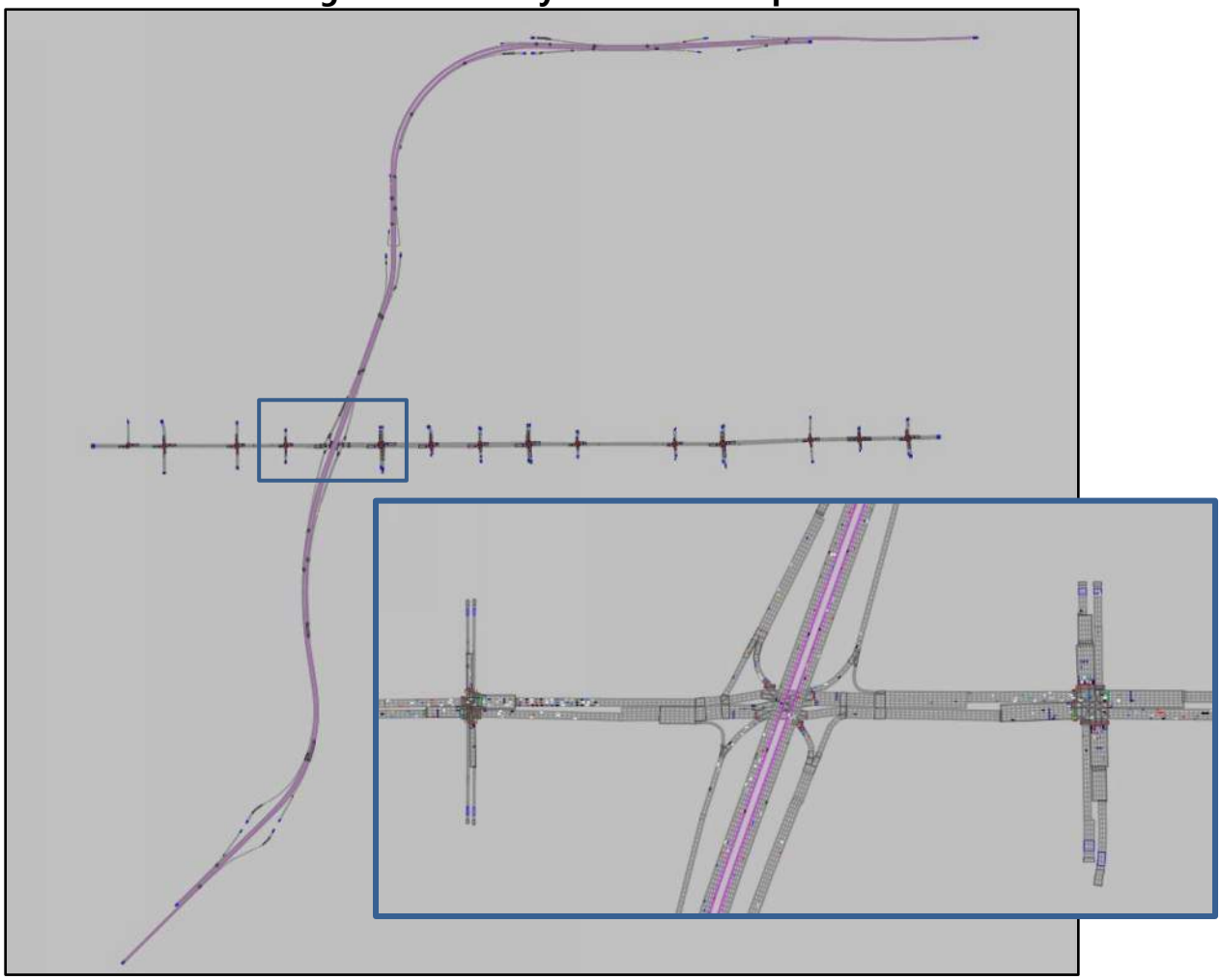
6.1.4 Highway Capacity Software (HCS) Modeling

HCS was used to assess the operational performance of SR-101L mainline segments for the future year a.m. and p.m. peak hour scenarios. The future year scenario includes an extra lane in each direction of travel along SR-101L, which is anticipated to be constructed by 2040. The analysis supplements the detailed microsimulation modeling analysis performed for the same scenarios in two ways: it is a check on the microsimulation model and a high-level assessment of corridor performance. Because HCS analysis is high-level, it does not capture the full picture of corridor operations that microsimulation analysis can—for example, the operational impacts of lane utilization and queueing.

6.1.5 Microsimulation Model

A microsimulation model was developed for the project Study Area using PTV Vissim (Version 10) software to provide a detailed assessment of traffic patterns in the Study Area. A microsimulation model is a detailed model, able to depict lanes, turn bays, parking, crosswalks, ramp meters, signals, and other physical characteristics of a network as one might see them in aerial imagery. It also allows the user to fine-tune a wide range of non-physical characteristics of the network, including signal timing, priority, and speed decisions. ***Figure 6.1*** provides a snapshot of the microscopic model constructed for this analysis, with a close-up of the Bell Road and SR-101L TI. The same signal timing plans used in Synchro, discussed in ***Section 6.1.3***, were implemented in this microsimulation model. The microsimulation model was run for existing a.m. and p.m. and future a.m. and p.m. scenarios using Vissim's dynamic assignment protocol in conjunction with refined OD matrices developed in Visum (***Section 6.1.6***). While the existing scenario reflected existing network conditions, the future conditions scenario was updated to include programmed future projects, including an additional general-purpose lane along SR-101L and additional ramp metering.

Figure 6.1 – Study Area Microscopic Model



6.1.6 Macrosimulation Model

A macrosimulation model was constructed for the Study Area using PTV Visum (Version 17) software. This model provided estimated turning movement counts for existing and future conditions at locations for which counts were not available. It also provided refined OD matrices, necessary for the dynamic assignment procedure used in the microsimulation model, calibrated through matrix estimation techniques.

Macrosimulation models contain significantly less detail than microsimulation models: intersections (called "nodes") are represented as dots; segments (called "links"), the connecting roadways between intersections, are represented by lines. Nodes and links can have attributes for the user to input specific characteristics of each element. While a macrosimulation model can quickly perform the iterations necessary to determine vehicle routing behavior and turning movement estimations, it does not yield the level

of detail for an assessment of operations that microsimulation modeling can. Therefore, both types of models are used together to achieve efficient, accurate assessment.

Network Characteristics

The existing Study Area microsimulation model created in Vissim was imported into Visum and refined for a macrosimulation analysis. For roadway segments with available counts, a.m. and p.m. peak hour counts were assigned as attributes to those segments. For intersections with available turning movement counts, a.m. and p.m. peak hour counts were assigned as attributes to those turning movements for both existing and future conditions. For future conditions, the existing Study Area network was updated to include a planned additional general-purpose lane along SR-101L. No other planned improvements were incorporated into the future macrosimulation model, as they are not expected to impact model output.

Matrix Estimation

Both turning movement counts and segment counts were used to calibrate Study Area OD matrices using a process called "matrix estimation." For this process, tolerances of 10 percent and 20 percent are assigned to segment counts and turning movement counts, respectively, based on existing count values. The matrix estimation process uses a seed matrix, constructed and estimated based on known volumes entering and exiting the Study Area, traffic counts and tolerances to develop a calibrated OD matrix for the Study Area. The process of OD-matrix estimation (or matrix calibration) converges when the traffic assignment using the estimated matrices results in a good correlation with observed traffic counts. This procedure was performed for both existing and future conditions. For future conditions, NCHRP-forecasted count volumes were used to calibrate the matrix. Using the estimated matrices, Visum assigns traffic volumes and turning movement counts throughout the Study Area. This process is useful for estimating counts at locations where counts were not collected and for refining initial OD matrices.

The correlation between the NCHRP-forecasted 2040 volumes and model-estimated volumes is shown for segments (links) in ***Figure 6.2*** and for turns in ***Figure 6.3*** for the p.m. peak hour. Model-estimated volumes are on the Y-axis; 2040 NCHRP-forecasted volumes are on the X-axis. The line y=x represents a perfect 1 to 1 correlation between the forecasted volumes and model-estimated volumes. The goal of matrix estimation is to achieve segment and turning movement counts which conform to this line as closely as possible.

Figure 6.2 – Matrix Estimation: 2040 p.m. Link Correlation

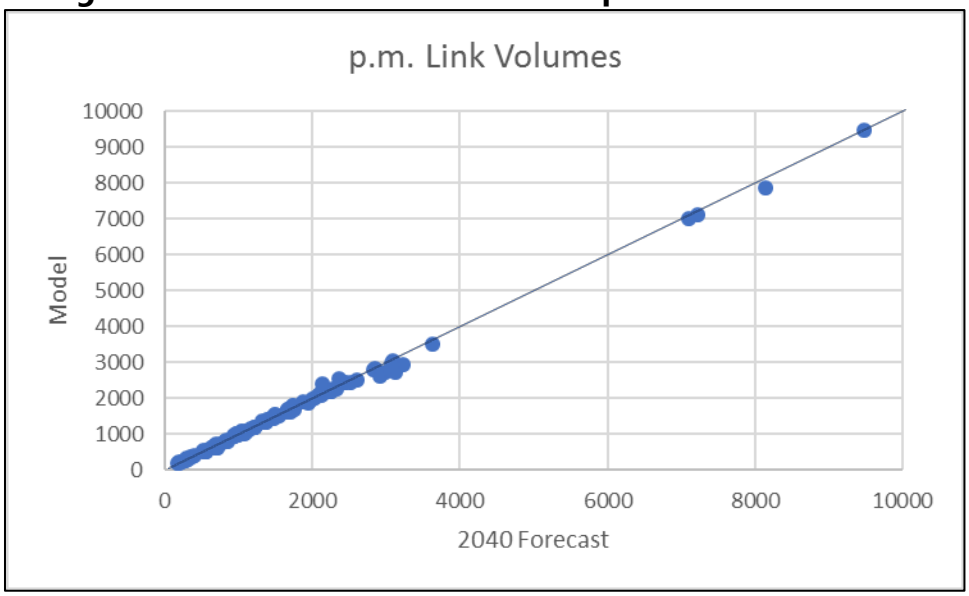


Figure 6.3 – Matrix Estimation: 2040 p.m. Turn Correlation

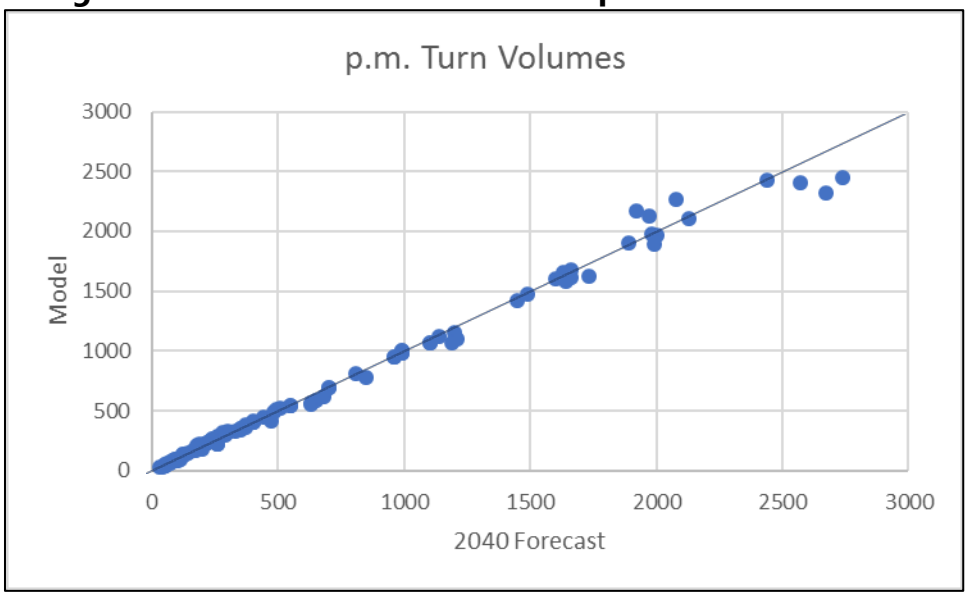


Figure 6.2 and ***Figure 6.3*** show matrix calibration resulted in a relatively good correlation between NCHRP-forecasted volumes and model-estimated volumes for the 2040 p.m. peak hour. Tests performed for the 2040 a.m. peak hour and existing peak hours yielded similar results.

6.2 Existing (2018) Conditions Analysis Results

A capacity analysis of existing conditions was performed for the Study Area using a combination of modeling techniques, discussed in ***Section 6.1***. The results of this

analysis are divided into the two distinct corridors comprising the Study Area: SR-101L and Bell Road. Select results are also presented for the network as a whole. For the purpose of this Study, LOS D and above was considered acceptable. Intersections and segments performing at LOS E or LOS F warrant consideration for potential improvement. Synchro reports are included in ***Appendix C***.

6.2.1 SR-101L Existing Capacity Analysis

A Synchro analysis assessing TI operations along SR-101L was performed for TIs within the Study Area extents for the a.m. and p.m. peak hours. The results of this analysis are presented in ***Table 13***, with delay, LOS, and queue length broken out by intersection approach and TIs listed in order from south to north. Intersections and intersection approaches that operate at LOS E are highlighted in orange; those operating at LOS F are highlighted in red.

Table 13 – SR-101L TIs Existing (2018) Capacity Analysis Results

Intersection[1]	Approach	a.m. Peak Hour			p.m. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
(1) Thunderbird Road & SB SR-101L	EB	25.7	C	212	29.9	C	292
	WB	41.1	D	300[2]	56.3	E	555[2]
	NB	N/A	N/A	N/A	N/A	N/A	N/A
	SB	18.8	B	297	30.7	C	355
	Overall	**30.9**	**C**	**N/A**	**41.7**	**D**	**N/A**
(2) Thunderbird Road & NB SR-101L	EB	33.4	C	198	39.3	D	327
	WB	32.1	C	252	40.6	D	428
	NB	49.5	D	853[2]	29.6	C	651[2]
	SB	N/A	N/A	N/A	N/A	N/A	N/A
	Overall	**38.8**	**D**	**N/A**	**37.5**	**D**	**N/A**
(3) Bell Road & SR-101L	EB	36.6	D	422	47.5	D	456[2]
	WB	46.1	D	267	49.9	D	472[2]
	NB	60.4	E	317	57.6	E	254[2]
	SB	44.8	D	136	49.6	D	177
	Overall	**43.0**	**D**	**N/A**	**49.6**	**D**	**N/A**
(4) Union Hills Drive & SB SR-101L	EB	30.0	C	230	34.2	C	272
	WB	55.0	D	399[2]	283.4	F	970[2]
	NB	N/A	N/A	N/A	N/A	N/A	N/A
	SB	11.0	B	106	7.6	A	87
	Overall	**35.9**	**D**	**N/A**	**151.5**	**F**	**N/A**
(5) Union Hills Drive & NB SR-101L	EB	42.8	D	251	48.8	D	318[2]
	WB	34.7	C	114	58.3	E	289
	NB	19.0	B	273	27.8	C	452
	SB	N/A	N/A	N/A	N/A	N/A	N/A
	Overall	**33.4**	**C**	**N/A**	**46.3**	**D**	**N/A**

Intersection[1]	Approach	a.m. Peak Hour			p.m. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
(6) 75th Avenue & WB SR-101L	EB	N/A	N/A	N/A	N/A	N/A	N/A
	WB	19.7	B	283	42.1	D	486
	NB	36.4	D	221	32.8	C	302
	SB	110.2	F	568[2]	37.0	D	283
	Overall	**71.1**	**E**	**N/A**	**37.7**	**D**	**N/A**
(7) 75th Avenue & EB SR-101L	EB	40.8	D	218	30.1	C	269
	WB	N/A	N/A	N/A	N/A	N/A	N/A
	NB	36.1	D	163	32.1	C	252
	SB	118.3	F	761[2]	70.2	E	485[2]
	Overall	**87.0**	**F**	**N/A**	**50.1**	**D**	**N/A**
(8) 67th Avenue & WB SR-101L	EB	N/A	N/A	N/A	N/A	N/A	N/A
	WB	44.2	D	371[2]	144.5	F	768[2]
	NB	95.6	F	502[2]	139.2	F	760[2]
	SB	23.2	C	320	33.3	C	257
	Overall	**46.6**	**D**	**N/A**	**108.9**	**F**	**N/A**
(9) 67th Avenue & EB SR-101L	EB	43.4	D	281	62.2	E	525[2]
	WB	N/A	N/A	N/A	N/A	N/A	N/A
	NB	47.1	D	380[2]	34.9	C	248
	SB	38.1	D	402	66.0	E	492[2]
	Overall	**41.5**	**D**	**N/A**	**55.7**	**E**	**N/A**

*[1]Refer to **Figure 4.4** for the intersection number.*

[2]Approximation from Synchro analysis due to upstream metering or volume exceeding capacity

In general, all TIs except the Bell Road and Thunderbird Road TIs, operate below an acceptable overall LOS in existing conditions.

6.2.2 Bell Road Existing Capacity Analysis

A Synchro analysis assessing intersection operations along Bell Road was performed for intersections within the Study Area extents for the a.m. and p.m. peak hours. The results of this analysis are presented in ***Table 14***, with delay and LOS broken out by intersection approach and intersections listed in order from west to east. Intersections and approaches to intersections that operate at LOS E are highlighted in orange; those operating at LOS F are highlighted in red. Intersections with a "2" next to the name were analyzed using model-estimated counts.

Table 14 – Bell Road Intersection Existing (2018) Capacity Analysis Results

Intersection[1]	Approach	A.M. Peak Hour			P.M. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
92nd Ave & Bell Rd[2]	EB	10.6	B	344	9.2	A	205
	WB	2.3	A	69	12.9	B	453
	NB	N/A	N/A	N/A	N/A	N/A	N/A
	SB	47.5	D	241	40.9	D	241[3]
	Overall	**9.9**	**A**	**N/A**	**13.3**	**B**	**N/A**
[1] 91st Ave & Bell Rd	EB	27.0	C	259[3]	35.3	D	504
	WB	30.0	C	380	50.8	D	765[3]
	NB	24.7	C	100	46.4	D	193[3]
	SB	35.0	D	219[3]	50.3	D	249[3]
	Overall	**28.8**	**C**	**N/A**	**44.7**	**D**	**N/A**
[2] 87th Ave & Bell Rd	EB	25.8	C	732	19.6	B	454
	WB	15.5	B	362	18.3	B	567
	NB	24.6	C	69	26.1	C	105
	SB	48.5	D	179[3]	34.6	C	135
	Overall	**22.6**	**C**	**N/A**	**19.9**	**D**	**N/A**
84th Ave & Bell Rd[2]	EB	45.0	D	840[3]	32.6	C	604
	WB	28.8	C	539	26.2	C	830[3]
	NB	23.8	C	37	24.8	C	142
	SB	27.9	C	48	57.1	E	191[3]
	Overall	**37.2**	**D**	**N/A**	**29.7**	**C**	**N/A**
[3] 83rd Ave & Bell Rd	EB	38.4	D	503	47.6	D	322
	WB	2.3	C	164	82.1	F	649[3]
	NB	44.1	D	146	59.3	E	319
	SB	43.2	D	152	57.0	E	358[3]
	Overall	**38.7**	**D**	**N/A**	**63.0**	**E**	**N/A**
[4] 79th Ave & Bell Rd	EB	19.6	B	364	30.8	C	320
	WB	19.2	B	145	18.6	B	253
	NB	30.5	C	25	29.9	C	144
	SB	18.6	B	55	30.1	C	234
	Overall	**19.5**	**B**	**N/A**	**25.3**	**C**	**N/A**
[5] 77th Ave & Bell Rd	EB	22.4	C	289	21.0	C	408
	WB	24.0	C	160	31.4	C	417
	NB	24.5	C	37	30.9	C	182
	SB	14.9	B	23	25.6	C	143
	Overall	**22.9**	**C**	**N/A**	**26.8**	**C**	**N/A**
[6] 75th Ave & Bell Rd	EB	32.7	C	336	43.7	D	370
	WB	24.6	C	175	49.1	D	770[3]
	NB	28.1	C	155	81.8	F	374[3]
	SB	34.2	C	85	65.3	E	263[3]
	Overall	**30.0**	**C**	**N/A**	**54.6**	**D**	**N/A**

Intersection[1]	Approach	A.M. Peak Hour			P.M. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
73rd Ave & Bell Rd[2]	EB	13.6	B	400	20.1	C	440
	WB	9.3	A	158	19.4	B	683
	NB	7.8	A	34	11.6	B	39
	SB	31.8	C	101	65.9	E	274[3]
	Overall	**12.6**	**B**	**N/A**	**21.4**	**C**	**N/A**
69th Ave & Bell Rd[2]	EB	11.8	B	441	16.5	B	469
	WB	8.0	A	164	27.5	C	1091[3]
	NB	9.7	A	32	11.2	B	35
	SB	40.1	D	116	58.7	E	227[3]
	Overall	**11.4**	**B**	**N/A**	**24.1**	**C**	**N/A**
[7] 67th Ave & Bell Rd	EB	31.7	C	649[3]	57.6	E	550
	WB	22.2	C	175	134.1	F	1067[3]
	NB	51.2	D	357[3]	119.3	F	520[3]
	SB	51.4	D	208	102.7	F	359[3]
	Overall	**37.5**	**D**	**N/A**	**104.6**	**F**	**N/A**
63rd Ave & Bell Rd[2]	EB	26.7	C	520[3]	32.8	C	524
	WB	17.3	B	137[3]	44.7	D	767[3]
	NB	15.5	B	64	43.2	D	295[3]
	SB	46.0	D	297[3]	59.9	E	476[3]
	Overall	**25.8**	**C**	**N/A**	**42.2**	**D**	**N/A**
[8] 59th Ave & Bell Rd	EB	38.0	D	596[3]	43.6	D	358
	WB	32.5	C	193	53.6	D	571[3]
	NB	59.9	E	357[3]	69.8	E	504[3]
	SB	63.1	E	440[3]	60.2	E	362[3]
	Overall	**46.2**	**D**	**N/A**	**56.0**	**E**	**N/A**

*[1]Refer to **Figure 4.4** for the intersection number.*

[2]Intersection counts were estimated using macrosimulation modeling.

[3]Approximation from Synchro analysis due to upstream metering or volume exceeding capacity

During the a.m. peak, all intersections perform at an acceptable LOS D or better, though the northbound and southbound approaches on 59th Avenue operate at a LOS E. During the p.m. peak, three intersections—83rd Avenue, 67th Avenue, and 59th Avenue—perform at an overall failing LOS, with 67th Avenue and Bell Road failing on all approaches to the intersection.

6.2.3 Network-Wide Existing Capacity Analysis

A network-wide analysis was conducted for the entire Study Area roadway network using microsimulation modeling techniques. The results of this analysis are presented in ***Table 15***.

Table 15 – Network-Wide Existing (2018) Capacity Analysis Results

Capacity Measurement	a.m. Peak	p.m. Peak
Average Delay/Vehicle (s)	59.1	115.4
Average Number of Stops	1.2	2.8
Average Speed (mph)	43.3	32.3

Table 15 shows that the network performs better in the a.m. peak hour, for which average delay per vehicle and average number of stops are approximately half what they are in the p.m. peak hour.

6.3 Future (2040) Conditions Analysis Results

A capacity analysis of future conditions was performed for the Study Area using a combination of modeling techniques, discussed in ***Section 6.1***. The results of this analysis are divided into the two distinct corridors comprising the Study Area: SR-101L and Bell Road. Select results are also presented for the network as a whole. For the purpose of this Study, LOS D and above was considered acceptable. Intersections and segments performing at LOS E or LOS F warrant consideration for potential improvement. Synchro reports are included in ***Appendix C***.

6.3.1 SR-101L Future Capacity Analysis

A Synchro analysis assessing TI operations along SR-101L was performed for TIs within the Study Area extents for the a.m. and p.m. peak hours for the future year (2040) condition. Two scenarios for SR-101L TIs were assessed in Synchro: a model containing future volumes with existing timings and a model containing future volumes with optimized timings. The overall LOS for each ramp terminal and each scenario is presented in ***Table 16***. Intersections and intersection approaches that operate at LOS E are highlighted in orange; those operating at LOS F are highlighted in red.

Table 16 – SR-101L TIs Existing and Future Capacity Analysis Comparison

Intersection	2018 Existing Overall LOS Analysis: Existing Timings			2040 Overall LOS: Existing Timings		2040 Overall LOS: Optimized Timings	
	Cycle Length (s) a.m. | p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Thunderbird Rd & SR-101L SB Ramp Terminal	145 | 145	C	D	C	E	D	E
Thunderbird Rd & SR-101L NB Ramp Terminal		D	D	E	D	D	E
Bell Rd & SR-101L	135 | 120	D	D	-	-	D	D
Union Hills Dr & SR-101L SB Ramp Terminal	130 | 130	D	F	D	F	C	E
Union Hills Dr & SR-101L NB Ramp Terminal		C	D	D	E	C	E
75th Ave & SR-101L EB Ramp Terminal	180 | 135	F	D	F	D	C	D
75th Ave & SR-101L WB Ramp Terminal		E	D	F	E	C	E
67th Ave & SR-101L EB Ramp Terminal	120 | 120	D	E	F	F	E	E
67th Ave & SR-101L WB Ramp Terminal		D	F	E	F	D	F
Note: Results use Synchro's built-in methodology to determine LOS.							

Regardless of signal timing, all TIs except the Bell Road TI operate at LOS E or LOS F in 2040. However, several TIs perform better under the future optimized timing scenario than they perform under existing conditions. Optimized timings are often used for future year traffic analyses because signal timings are typically adjusted every few years to account for growth, nearby traffic improvements, and other factors that can impact travel patterns at intersections. Detailed capacity analysis results for the optimized timing scenario are presented in ***Table 17***, including delay, LOS, and 95th percentile queue length.

Table 17 – SR-101L TIs Future (2040) Capacity Analysis with Optimized Timings

Intersection[1]	Approach	A.M. Peak Hour			P.M. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
(1) Thunderbird Road & SB SR-101L	EB	31.7	C	235	41.5	D	486[2]
	WB	71.8	E	449[2]	98.3	F	591[2]
	NB	N/A	N/A	N/A	N/A	N/A	N/A
	SB	10.5	B	220	20.4	C	348
	Overall	**44.2**	**D**	**N/A**	**63.1**	**E**	**N/A**
(2) Thunderbird Road & NB SR-101L	EB	85.4	F	371[2]	111.5	F	496[2]
	WB	29.0	C	242	35.8	D	406
	NB	37.2	D	809[2]	44.4	D	748[2]
	SB	N/A	N/A	N/A	N/A	N/A	N/A

Intersection[1]	Approach	A.M. Peak Hour			P.M. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
	Overall	**48.6**	**D**	**N/A**	**63.3**	**E**	**N/A**
(3) Bell Road & SR-101L	EB	41.1	D	433	58.7	E	593[2]
	WB	47.1	D	264	37.0	D	369[2]
	NB	41.9	D	334	65.4	E	329[2]
	SB	33.1	C	130	47.4	D	188
	Overall	**42.1**	**D**	**N/A**	**49.0**	**D**	N/A
(4) Union Hills Drive & SB SR-101L	EB	20.9	C	210	21.1	C	239
	WB	32.1	C	294	96.2	F	713[2]
	NB	N/A	N/A	N/A	N/A	N/A	N/A
	SB	14.7	B	161	12.9	C	147
	Overall	**23.4**	**C**	**N/A**	**54.0**	**E**	**N/A**
(5) Union Hills Drive & NB SR-101L	EB	20.0	C	2769	57.9	E	438[2]
	WB	27.6	C	106	24.7	C	235
	NB	28.6	C	327	89.4	F	673[2]
	SB	N/A	N/A	N/A	N/A	N/A	N/A
	Overall	**24.2**	**C**	**N/A**	**54.3**	**E**	**N/A**
(6) 75th Avenue & WB SR-101L	EB	N/A	N/A	N/A	N/A	N/A	N/A
	WB	31.1	C	373[2]	63.5	E	728[2]
	NB	25.6	C	162	83.2	F	672[2]
	SB	14.7	B	251	19.7	B	214
	Overall	**21.4**	**C**	**N/A**	**55.4**	**E**	**N/A**
(7) 75th Avenue & EB SR-101L	EB	44.9	D	210	36.6	D	315
	WB	N/A	N/A	N/A	N/A	N/A	N/A
	NB	40.1	D	364[2]	24.2	C	243
	SB	27.9	C	635[2]	64.8	E	425[2]
	Overall	**33.5**	**C**	**N/A**	**45.6**	**D**	**N/A**
(8) 67th Avenue & WB SR-101L	EB	N/A	N/A	N/A	N/A	N/A	N/A
	WB	72.1	E	603[2]	122.2	F	846[2]
	NB	53.8	D	477[2]	124.7	F	773[2]
	SB	21.4	C	323	30.5	C	309
	Overall	**44.5**	**D**	**N/A**	**97.4**	**F**	**N/A**
(9) 67th Avenue & EB SR-101L	EB	40.4	D	308[2]	33.0	C	400
	WB	N/A	N/A	N/A	N/A	N/A	N/A
	NB	77.3	E	702[2]	30.9	C	427[2]
	SB	54.0	D	665[2]	132.7	F	654[2]
	Overall	**57.5**	**E**	**N/A**	**75.1**	**E**	**N/A**

[1]*Refer to **Figure 4.4** for the intersection number.*

[2]*Approximation from Synchro analysis due to upstream metering or volume exceeding capacity*

During the p.m. peak hour, all TIs except the Bell Road TI operate below LOS D. ***Table 18*** presents the results of a 2040 capacity analysis performed for SR-101L segments using HCS analysis. A microsimulation analysis was also performed for SR-

101L segments, however, the results are biased by congestion entering the network. Microsimulation results can be provided upon request.

Table 18 – SR-101L Future (2040) Mainline Segment LOS

Segment	a.m. Peak		p.m. Peak	
	North/East-Bound	South/West-Bound	North/East-Bound	South/West-Bound
	LOS	LOS	LOS	LOS
Thunderbird Rd to Bell Rd	D	D	C	D
Bell Rd to Union Hills Dr	C	D	F	F
Union Hills Dr to 75th Ave	C	C	C	C
75th Ave to 67th Ave	D	D	C	F

Improvements which include additional ramp metering and the one additional general purpose lane in each direction along SR-101L within the Study Area are anticipated to be constructed by 2040. Including those improvements in the 2040 operations analysis, the westbound segment between the 67th Avenue and 75th Avenue TIs and both northbound and southbound segments between the Bell Road and Union Hills Drive TIs are expected to operate at LOS F in the 2040 p.m. peak hour. The remainder of segments operate at LOS C or D.

6.3.2 Bell Road Future Capacity Analysis

A Synchro analysis assessing intersection operations along Bell Road was performed for intersections within the Study Area for the a.m. and p.m. peak hours. The results of this analysis are presented in ***Table 19,*** with delay and LOS broken out by intersection approach and intersections listed in order from west to east. Intersections and approaches to intersections that operate at LOS E are highlighted in orange; those operating at LOS F are highlighted in red. Intersections with a "2" next to the name were analyzed using model-estimated counts.

Table 19 – Bell Road Intersections Future (2040) Capacity Analysis Results

Intersection[1]	Approach	A.M. Peak Hour			P.M. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
92nd Ave & Bell Rd[2]	EB	17.9	B	388	13.0	B	295
	WB	4.4	A	99	3.8	A	100[3]
	NB	N/A	N/A	N/A	N/A	N/A	N/A
	SB	32.3	C	269	45.6	D	328
	Overall	**13.4**	**B**	**N/A**	**10.2**	**B**	**N/A**
[1] 91st Ave & Bell Rd	EB	40.6	D	578[3]	33.0	C	308
	WB	35.8	D	413[3]	72.5	E	816[3]
	NB	27.9	C	129	58.0	E	278[3]
	SB	40.4	D	249[3]	58.8	E	355[3]
	Overall	**37.7**	**D**	**N/A**	**55.7**	**E**	**N/A**
[2] 87th Ave & Bell Rd	EB	30.5	C	821	20.0	C	536
	WB	12.7	B	204	20.8	C	734
	NB	23.6	C	66	34.8	C	153
	SB	39.8	D	116	31.6	C	104
	Overall	**23.3**	**C**	**N/A**	**21.6**	**C**	**N/A**
84th Ave & Bell Rd[2]	EB	61.5	E	950[3]	70.7	E	935[3]
	WB	30.1	C	542	40.1	D	1016[3]
	NB	17.0	B	45	53.1	D	357[3]
	SB	41.5	D	87	189.5	F	376[3]
	Overall	**45.8**	**D**	**N/A**	**58.5**	**E**	**N/A**
[3] 83rd Ave & Bell Rd	EB	35.5	D	543	58.5	E	458
	WB	33.8	C	188	154.8	F	801
	NB	45.9	D	155	92.8	F	388
	SB	44.7	D	193[3]	69.9	E	532
	Overall	**38.0**	**D**	**N/A**	**99.0**	**F**	**N/A**
[4] 79th Ave & Bell Rd	EB	22.8	C	422	44.0	D	412
	WB	10.2	B	51	55.4	E	656[3]
	NB	28.0	C	34	29.5	C	160
	SB	23.2	C	76	31.0	C	317
	Overall	**19.4**	**B**	**N/A**	**46.4**	**D**	**N/A**
[5] 77th Ave & Bell Rd	EB	5.7	A	136	23.2	C	493
	WB	23.7	C	206	12.9	B	111[3]
	NB	32.0	C	23	26.0	C	98
	SB	23.4	C	46	32.5	C	294[3]
	Overall	**12.1**	**B**	**N/A**	**19.4**	**B**	**N/A**
[6] 75th Ave & Bell Rd	EB	30.6	C	450	34.2	C	291[3]
	WB	25.9	C	243	130.5	F	1117[3]
	NB	37.1	D	177	87.2	F	310[3]
	SB	42.2	D	103	83.5	F	264[3]
	Overall	**31.6**	**C**	**N/A**	**88.9**	**F**	**N/A**

Intersection[1]	Approach	A.M. Peak Hour			P.M. Peak Hour		
		Delay (s)	LOS	95th % Queue (ft)	Delay (s)	LOS	95th % Queue (ft)
73rd Ave & Bell Rd[2]	EB	14.4	B	469	19.5	B	509
	WB	10.2	B	168	21.2	C	846
	NB	9.0	A	32	12.5	B	41
	SB	29.2	C	76	64.8	E	258[3]
	Overall	**13.2**	**B**	**N/A**	**21.9**	**C**	**N/A**
69th Ave & Bell Rd[2]	EB	14.2	B	472	19.9	B	576
	WB	9.2	A	172	47.4	D	1247[3]
	NB	10.8	B	36	15.4	B	48
	SB	34.4	C	108	70.0	E	283[3]
	Overall	**13.2**	**B**	**N/A**	**37.5**	**D**	**N/A**
[7] 67th Ave & Bell Rd	EB	59.9	E	774[3]	82.7	F	643[3]
	WB	29.9	C	204	228.6	F	1173[3]
	NB	71.8	E	578[3]	221.7	F	817[3]
	SB	64.0	E	354[3]	160.5	F	557[3]
	Overall	**59.3**	**E**	**N/A**	**176.5**	**F**	**N/A**
63rd Ave & Bell Rd[2]	EB	31.7	C	669[3]	34.5	C	586
	WB	20.8	C	185[3]	50.4	D	876[3]
	NB	16.0	B	65	44.3	D	297[3]
	SB	54.2	D	372[3]	63.3	E	497[3]
	Overall	**30.6**	**C**	**N/A**	**45.8**	**D**	**N/A**
[8] 59th Ave & Bell Rd	EB	55.7	E	747[3]	54.0	D	396[3]
	WB	38.6	D	240	58.1	E	631[3]
	NB	81.6	F	435[3]	88.3	F	563[3]
	SB	68.6	E	500[3]	79.2	E	403[3]
	Overall	**59.9**	**E**	**N/A**	**67.7**	**E**	**N/A**

*[1]Refer to **Figure 4.4** for the intersection number.*

[2]Intersection counts were estimated using macrosimulation modeling.

[3]Approximation from Synchro analysis due to upstream metering or volume exceeding capacity

During the a.m. peak hour, most of the intersections along Bell Road continue to operate at a LOS D or better. During the p.m. peak hour, several intersections operate below acceptable LOS.

6.3.3 Network-Wide Future Capacity Analysis

A network-wide analysis was conducted for the entire Study Area roadway network using microsimulation modeling techniques to model 2040 conditions. The results of this analysis are presented in ***Table 20.***

Table 20 – Network-Wide Capacity Analysis Results

Capacity Measurement	a.m. Peak	p.m. Peak
Average Delay/Vehicle (s)	79.9	213.5
Average Number of Stops	2.1	11.5
Average Speed (mph)	41.7	24.4

Table 20 shows that the 2040 network performs better in the a.m. peak hour than the p.m. peak hour, similar to existing conditions. The 2040 network performs somewhat worse than the existing network in the a.m. peak hour. However, the 2040 p.m. network performs considerably worse than the existing p.m. network.

6.4 Greenway TI Analysis

The traffic impact of a potential new partial SR-101L TI at Greenway Road for northbound traffic was assessed using the travel demand modeling software, TransCAD. Traffic patterns within the vicinity of the potential new TI were examined with and without the new TI. 2040 ADT estimates for the Thunderbird Road TI, potential Greenway Road TI, and Bell Road TI are presented for both scenarios in ***Table 21***. With the new TI, traffic on the Thunderbird Road off ramp is expected to increase and traffic on the on ramp is expected to decrease. The same is true for the Bell Road TI. The expected demand shift to the Greenway TI in the future peak hour is approximately 400 vehicles. In general, the potential Greenway TI is not expected to significantly improve operations along Thunderbird Road, Bell Road, or 83rd Avenue. In addition, the new TI introduces a short weaving section along SR-101L, which has the potential to increase congestion along mainline SR-101L. A weaving analysis was not performed for this scenario as part of this study.

Table 21 – Greenway TI Analysis Results

SR-101L TI Ramp	2040 ADT Estimates	
	Without Greenway TI	With Greenway TI
NB Off Ramp to Thunderbird Rd	14780	15021
NB On Ramp from Thunderbird Rd	10946	8500
NB Off Ramp to Greenway Rd	-	2800
NB On Ramp from Greenway Rd	-	3800
NB Off Ramp to Bell Rd	16000	16509
NB On Ramp from Bell Rd	14053	13300

7.0 Conclusion

The analysis assessed the safety and traffic operations of mainline segments and TIs along SR-101L from Thunderbird Road to 67th Avenue and of intersections along Bell Road from 92nd Avenue to 59th Avenue for existing (2018) and future (2040) years. ***Table 22*** presents the key findings of this study. Additional findings are discussed in more detail below.

Table 22 – Key Study Findings

Analysis Area	Safety	Operations
Existing SR-101L TIs	High crash frequency at 67th Avenue and Bell Rd TIs.	Except Bell Rd, all TIs perform below LOS D in 2040, optimized or not.
Bell Road Intersections	High number of rear-end crashes at 83rd Avenue.	91st, 84th, 83rd, 67th, and 59th Avenues all perform below LOS D in 2040.
SR-101L Mainline	Crash "hot spot" is located between 67th and 75th Avenue TIs.	Mainline performs at LOS F between Bell Rd and Union Hills Dr and SB/WB between 75th and 67th Avenues.
Greenway Road TI	N/A	No significant operational improvement.

Traffic Forecast

Between 2018 and 2040, traffic demand on SR-101L within the Study Area is expected to grow between 22 and 34 percent. The most growth is expected nearest the Thunderbird Road TI, while the least growth is expected east of the 67th Avenue TI. Improvements which include additional ramp metering and one additional general purpose lane in each direction along SR-101L within the Study Area are anticipated to be constructed by 2040.

SR-101L Mainline and TIs

Incorporating growth and programmed improvements in the 2040 operations analysis, the following operational needs were identified for the SR-101L mainline and TIs:

- The westbound segment between the 67th Avenue and 75th Avenue TIs operates at LOS F in the 2040 p.m. peak hour.
- Both northbound and southbound segments between the Bell Road and Union Hills Drive TIs are expected to operate at LOS F in the 2040 p.m. peak hour.
- All other SR-101L mainline segments operate at LOS C or D in 2040.

- In 2040, all TIs except the Bell Road TI operate at LOS E or LOS F in at least one peak hour (primarily the p.m.), regardless of whether signal timings are optimized or not.

The following safety needs were identified for the SR-101L mainline and TIs:

- The highest crash density on SR-101L occurs between the 75th Avenue and 67th Avenue TIs.
- The highest number of rear end and same-direction sideswipe crashes, typically congestion-related crash types, occur between the 75th Avenue and 67th Avenue TIs.
- The segments of SR-101L between the Thunderbird Road and Bell Road TIs and the Bell Road and Union Hills Drive TIs are also crash "hot spots."
- The most single vehicle crashes happen between the Thunderbird Road and Bell Road TIs.
- The most total, rear end, left-turn, angle, and same-direction sideswipe crashes happen at the 67th Avenue TI intersection.
- The most single vehicle crashes happen at the Bell Road TI intersection.

Bell Road Intersections

Along Bell Road, the most traffic growth is expected in the vicinity of the Arrowhead Town Center (12 percent). Expected traffic growth is approximately six percent east of Arrowhead Town Center and less west of the Bell Road and SR-101L TI.

The following operational needs were identified for Bell Road intersections:

- In 2040, approximately half of the intersections within the Study Area operate at LOS E or LOS F in at least one peak hour.
- Intersections operating at LOS F include 83rd Avenue, 75th Avenue, and 67th Avenue.
- Intersections operating at LOS E include 91st Avenue, 84th Avenue, and 59th Avenue.

The following safety needs were identified for Bell Road intersections:

- 83rd Avenue has the most crashes overall.
- 83rd Avenue has the most angle, rear end, and same-direction sideswipe crashes—crash types typically associated with congestion.

Potential Greenway Road TI

An analysis for a potential new TI at Greenway Road was also conducted. The analysis found:

- A new TI at Greenway Road shows no significant improvement in operations along Thunderbird Road, Bell Road, or 83rd Avenue.
- The expected shift in traffic demand in the future peak hour to the potential new TI would be approximately 400 vehicles.
- A new TI at Greenway Road would introduce a short weaving section along SR-101L, which could increase congestion along mainline SR-101L.

Appendix B

SR-101L /67th Avenues Service Traffic Interchanges

Operational Analysis

Prepared for

MARICOPA ASSOCIATION of GOVERNMENTS

Prepared by

BURGESS & NIPLE

1500 N. Priest Drive
Suite 102
Tempe, AZ 85281

February 2020

Table of Contents

1.0 Introduction 1
2.0 Crash Analysis 1
2.1 67th Avenue & Westbound Beardsley Road Intersection 6
2.2 67th Avenue & Eastbound Beardsley Road Intersection 7
2.3 Beardsley Road Mall Accessway 8
2.4 Operational Analysis Methodology 9
2.5 Highway Access at 67th Avenue 9
2.5.1 No Build 9
2.5.2 Triple Left Turn 10
2.5.3 Dual Roundabouts 12
2.5.4 Diverging Diamond Interchange (DDI) 13
2.5.5 Continuous Flow Interchange (CFI) 14
3.0 Conclusion 17

List of Figures

Figure 2.1 – 67th Avenue Crash Severity Map....3
Figure 2.2 – Beardsley Road Mall Accessway....8
Figure 2.3 – 67th Avenue TI Triple Left....11
Figure 2.4 – 67th Roundabouts Approximate Geometry....12
Figure 2.5 – 67th DDI Approximate Geometry....13
Figure 2.6 – 67th SBL CFI Approximate Geometry....14
Figure 2.7 – 67th NBL CFI Approximate Geometry....16

List of Tables

Table 1: 67th Avenue TI Crash Severity Summary 2014-2018....1
Table 2: 67th Avenue TI Detailed Crash Severity 2014-2018....2
Table 3: First Harmful Event....4
Table 4: Manner of Collision in Multi-Vehicle Crashes....4
Table 5: Intersections of Interest....5
Table 6: Manner of Collision in Multi-Vehicle Crashes at 67th Avenue & Westbound Beardsley Road Intersection....6
Table 7: Manner of Collision in Multi-Vehicle Crashes at 67th Avenue & Eastbound Beardsley Road Intersection....7
Table 8: Manner of Collision in Multi-Vehicle Crashes at Beardsley Mall Intersection....8
Table 9: Summary of Alternatives....17

1.0 Introduction

This analysis is a supplement to the SR-101L/75th Avenue Traffic Interchange (TI) Feasibility Study and is intended to identify feasible alternatives to improve intersection operations at the SR-101L/67th Avenue TI.

While the interchanges display similar characteristics, the 67th Avenue TI poses additional challenges to improving intersection operations, including several commercial access points in close proximity to the TI and higher projected vehicle volumes entering the TI from all approaches.

Four concepts at the SR-101L/67th Avenue TI were identified and evaluated during the study: (1) a diamond interchange with three southbound left turn lanes, (2) dual roundabouts, (3) a DDI, and (4) a continuous flow interchange (CFI).

2.0 Crash Analysis

Crash data for the five-year period from January 1, 2014 to December 31, 2018 was obtained from the Arizona Department of Transportation (ADOT) Accident Location Incident Surveillance System (ALISS) database for the interchanges associated with SR-101L at 67th Avenue.

Within the analysis period, 364 crashes occurred within in the TI area. The majority of the crashes were classified as property damage only (PDO) at 292 crashes. There was one fatal crash that was reported as other; further analysis indicated it was a pedestrian fatality. The fatality occurred at Beardsley Road near North 68th Drive in 2017. The incapacitating crash was an angle crash. A summary of total crashes is provided in **Table 1**. **Table 2** provides a more detailed list of the crash severity. Comparisons are offered based upon the *Arizona Motor Vehicle Crash Facts* (Crash Facts) published by ADOT in June 2018 (the latest available data).

Table 1: 67th Avenue TI Crash Severity Summary 2014-2018

Crash Severity	Number	Percent of Total	2018 Statewide Urban Average
Property Damage Only	292	80.2%	70.6%
Injury	71	19.5%	28.7%
Fatal	1	0.3%	0.7%
Grand Total	**364**	**100.0%**	**100.0%**

Table 2: 67th Avenue TI Detailed Crash Severity 2014-2018						
Crash Severity	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
Fatal	0	0	0	1	0	1
Incapacitating	0	0	1	0	0	1
Non-incapacitiating	5	3	1	3	4	16
Possible Injury	12	10	16	9	7	54
Property Damage Only	52	48	50	59	83	292
Total	**69**	**61**	**68**	**72**	**94**	**364**

A crash map detailing crash severity and location are below in **Figure 2.1**. As shown in **Table 3**, there is a higher occurrence of crashes involving other vehicles and other non-collisions compared to the urban statewide average. Comparatively, collisions with motor vehicles in transport and other non-collision are nearly 1.2 and 1.5 times greater than the statewide average, respectively.

Figure 2.1 – 67th Avenue Crash Severity Map

Table 3: First Harmful Event			
Collision Manner	**Number**	**Percent**	**Statewide Urban %**
Collision with Motor Vehicle in Transport	345	***94.8%***	80.5%
Overturning	2	0.5%	0.8%
Collision with Pedestrian	2	0.5%	1.4%
Collision with Pedal cyclist	0	0.0%	1.1%
Collision with Animal	0	0.0%	0.3%
Collision with Fixed Object	14	3.8%	7.7%
Collision with Non-Fixed Object*	0	0.0%	4.3%
Vehicle Fire or Explosion	0	0.0%	0.1%
Other Non-Collision**	1	***0.3%***	0.2%
Unknown	0	0.0%	3.7%
Total	**364**	**100.0%**	**100.0%**

* Includes Collision with parked Vehicles, Trains, Railway Vehicles, and Work Zone Equipment
** Includes Vehicle Immersion, Jackknife, and Cargo Loss or Shift
Note: Cells with bold, red text denote percentages above the statewide average

Table 4 details the manner of collision for multiple vehicle crashes within the Study Area. Angle, left turn, and sideswipe same direction crashes each exceed the statewide average. Angle and left turn crashes are particularly high at nearly 1.5 and 1.2 times the statewide average, respectively.

Table 4: Manner of Collision in Multi-Vehicle Crashes			
Type of Crash	**Number of Crashes**	**Percent of Total**	**2018 Statewide Average**
Angle	76	***21.7%***	14.5%
Left Turn	69	***19.7%***	16.5%
Rear End	133	38.0%	44.4%
Head-On	2	0.6%	1.7%
Sideswipe Same Direction	61	***17.4%***	15.5%
Sideswipe Opposite Direction	1	0.3%	1.4%
Other*	6	1.7%	5.2%
Unknown	2	0.6%	0.67%
Total	**350**	**100.0%**	**100.0%**

*Other includes pedestrian and rear to rear crashes
Note: Cells with bold, red text denote percentages above the statewide average

Based on crash frequency and severity, more detailed analysis was performed for the intersections with the TI ramp intersections at 67th Avenue. Additionally, the mall accessway on Beardsley Road east of 67th Avenue was assessed. **Table 5** depicts the number of crashes and their severity for the previously mentioned intersections.

Table 5: Intersections of Interest

Intersection	Number of Crashes	Fatal Crashes	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Property Damage Only
67th Avenue & Westbound Beardsley Road	137	0	0	6	14	117
77th Avenue & Eastbound Beardsley Road	121	0	1	5	19	96
67th Avenue & Beardsley Mall Access	26	0	0	1	5	20
Total	**284**	**0**	**1**	**12**	**38**	**233**

2.1 67th Avenue & Westbound Beardsley Road Intersection

There was a total of 137 crashes at the 67th Avenue and westbound Beardsley Road intersection. This included two single vehicle crashes, all of which were with fixed objects. Rear-end crashes were the most common crash type; 62 (45.9%) occurred at the intersection at a rate slightly above the statewide average; angle crashes occurred at a rate 1.5 times the statewide average. **Table 6** lists the manner of collision in multi-vehicle crashes for the 67th Avenue and westbound Beardsley Road intersection.

Table 6: Manner of Collision in Multi-Vehicle Crashes at 67th Avenue & Westbound Beardsley Road Intersection

Type of Crash	Number of Crashes	Percent of Total	2018 Statewide Average
Angle	31	***23.0%***	14.5%
Left Turn	20	14.8%	16.5%
Rear End	62	***45.9%***	44.4%
Head-On	1	0.7%	1.7%
Sideswipe Same Direction	19	14.1%	15.5%
Sideswipe Opposite Direction	1	0.7%	1.4%
Other	0	0%	5.2%
Unknown	1	0.7%	0.67%
Total	**135**	**100.0%**	**100.0%**

Note: Cells with bold, red text denote percentages above the statewide average

2.2 67th Avenue & Eastbound Beardsley Road Intersection

There was a total of 121 crashes at the 67th Avenue and eastbound Beardsley Road intersection. This included ten single vehicle crashes, seven were with a fixed object, two were overturning, and one with a pedestrian. The pedestrian crash occurred in the crosswalk as the pedestrian was traveling south; the vehicle was making an eastbound left-turn at the time of the collision. Rear-end crashes were the most common crash type; 39 (34.5%) occurred at the intersection at a rate below the statewide average. Angle and sideswipe same direction crashes were both above the statewide average at rates 2 and 1.3 times greater, respectively. **Table 7** lists the manner of collision in multi-vehicle crashes for the 67th Avenue and eastbound Beardsley Road intersection.

Table 7: Manner of Collision in Multi-Vehicle Crashes at 67th Avenue & Eastbound Beardsley Road Intersection

Type of Crash	Number of Crashes	Percent of Total	2018 Statewide Average
Angle	33	***29.2%***	14.5%
Left Turn	15	13.3%	16.5%
Rear End	39	34.5%	44.4%
Head-On	1	0.9%	1.7%
Sideswipe Same Direction	23	***20.4%***	15.5%
Sideswipe Opposite Direction	0	0.0%	1.4%
Other*	2	1.8%	5.2%
Unknown	0	0.0%	0.67%
Total	**113**	**100.0%**	**100.0%**

*Other includes pedestrian and a miscoded fixed object crash
Note: Cells with bold, red text denote percentages above the statewide average

2.3 Beardsley Road Mall Accessway

The eastern mall accessway is one of two driveways which allows for vehicle right-in right-out access between Beardsley Road and the mall parking lot to the northeast of the 67th Avenue TI. This mall accessway intersection is shown in **Figure 2.2**.

Figure 2.2 – Beardsley Road Mall Accessway

There was a total of 26 crashes at the Beardsley Road Mall Accessway intersection. This included three single vehicle crashes, all of which were with fixed objects. Rear-end crashes were the most common crash type; 17 (70.8%) occurred at the intersection at a rate nearly 1.6 times greater than the statewide average. Sideswipe same direction also exceeded the statewide average at 1.3 times greater. **Table 8** lists the manner of collision in multi-vehicle crashes for the Beardsley Mall Accessway intersection.

Table 8: Manner of Collision in Multi-Vehicle Crashes at Beardsley Mall Intersection

Type of Crash	Number of Crashes	Percent of Total	2018 Statewide Average
Angle	1	4.2%	14.5%
Left Turn	0	0.0%	16.5%
Rear End	17	***70.8%***	44.4%
Head-On	0	0.0%	1.7%
Sideswipe Same Direction	5	***20.8%***	15.5%
Sideswipe Opposite Direction	0	0.0%	1.4%
Other*	1	4.2%	5.2%
Unknown	0	0.0%	0.67%
Total	**24**	**100.0%**	**100.0%**

*Other includes a miscoded fixed object crash
Note: Cells with bold, red text denote percentages above the statewide average

2.4 Operational Analysis Methodology

Narrative detailing the Operational Analysis Methodology is included in Section 2.4 in the main report of this study.

2.5 Highway Access at 67th Avenue

Operational analysis was performed to evaluate four alternatives: (1) a diamond interchange with three southbound left turn lanes, (2) dual roundabouts, (3) a DDI, and (4) a continuous flow interchange (CFI).

The goal of improving intersection operations was weighed against the constraints of preserving Beardsley Road access, salvaging the existing structure over SR-101L, and avoiding conflict with the city of Glendale sewage lift station on the northwest corner of 67th Avenue and westbound Beardsley Road.

Presently, the existing intersections operate at LOS D/F at westbound Beardsley Road and LOS D/E at eastbound Beardsley Road in the a.m. and p.m. peak hours.

Alternatives 2 through 4 present operational challenges, with one or more intersections operating at a failing LOS in the a.m. or p.m. peak hour. Preliminary geometric designs and cost estimates were not pursued for these alternatives.

2.5.1 No Build

This alternative analyzes the no build conditions. Future volumes are analyzed with existing signal timings.

The existing intersections operate at LOS E/F at westbound Beardsley Road and LOS F/F at eastbound Beardsley Road in the 2040 a.m. and p.m. peak hours, respectively. There is a high volume of vehicles entering the TI from all approaches. Only the southbound approach to the westbound Beardsley Road intersection and the eastbound approach to the eastbound Beardsley Road intersection are forecasted to operate at a passing LOS during the a.m. or p.m. peak hour.

2.5.2 Triple Left Turn

This alternative analyzes triple southbound left turn lanes. The existing number of lanes at each approach is preserved, with the addition of a third southbound left turn storage lane across the bridge.

A high percentage of the southbound left-turning vehicles are destined for SR-101L eastbound. To ensure that all three left turn lanes are utilized, all three lanes feed onto the entrance ramp to SR-101L, but the entrance ramp still enters the mainline as a single lane. The distance needed along the ramp to reduce the number of lanes from three to one result in the new entrance ramp gore location approximately 500-feet from the existing 59th Avenue exit ramp gore location.

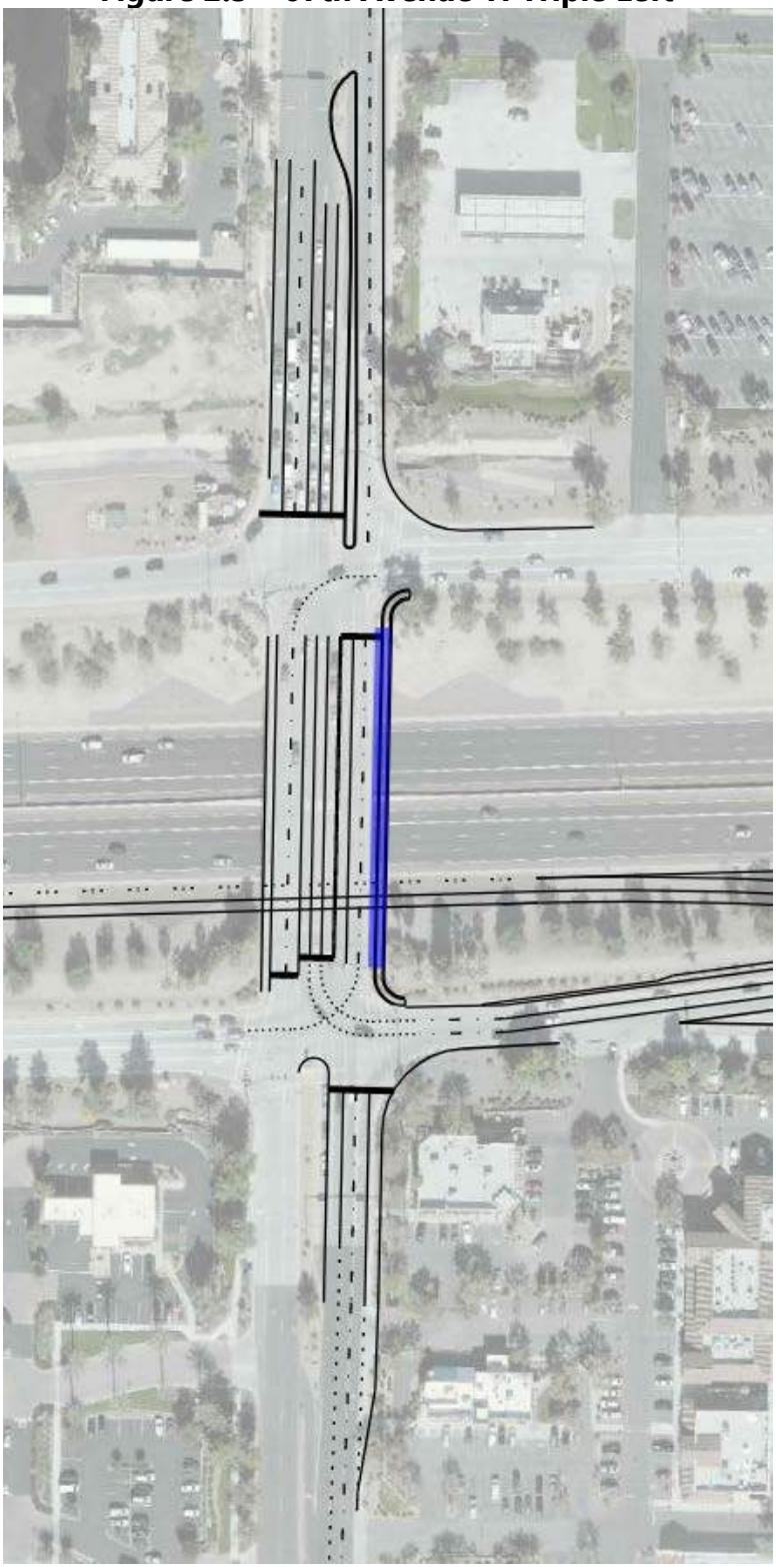
To avoid failing weave operations along SR-101L between 67th and 59th Avenues, the eastbound 59th Avenue exit ramp gore is shifted to the west to create a braided ramp between the 59th Avenue exit ramp and the overlapping 67th Avenue entrance ramp. A 400-foot long, high-skew structure is necessary to convey the entrance ramp from 67th Avenue over the exit ramp to 59th Avenue.

The existing intersections operate at LOS C/D at westbound Beardsley Road and LOS C/C at eastbound Beardsley Road in the 2040 a.m. and p.m. peak hours, respectively. The westbound approach to the westbound terminal is forecasted to operate at a failing LOS in the p.m. peak hour.

The estimated cost of this alternative is $40,106,000.

Intersection improvements at 67th Avenue are shown in **Figure 2.3**.

Figure 2.3 – 67th Avenue TI Triple Left



2.5.3 Dual Roundabouts

This alternative analyzes two 3-lane roundabouts. Each approach has two through lanes and a bypass right-turn lane where permitted. **Figure 2.4** shows the approximate geometric layout.

The existing intersections operate at LOS E/F at westbound Beardsley Road and LOS F/F at eastbound Beardsley Road in the 2040 a.m. and p.m. peak hours, respectively. There are insufficient gaps to permit frequent entrance to the roundabout from the east and westbound approaches. The two lanes at the southbound approach to the northern circle lack the capacity to accommodate the high volume of southbound traffic.

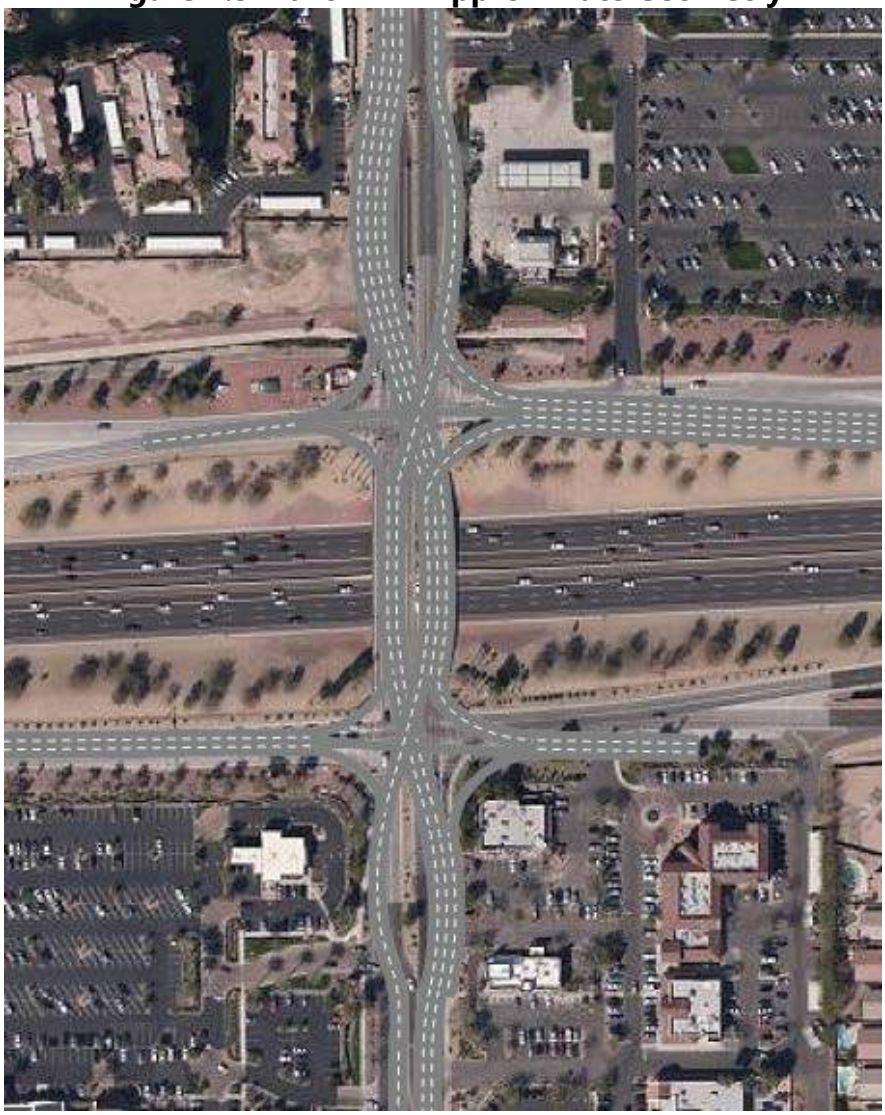
Figure 2.4 – 67th Roundabouts Approximate Geometry

2.5.4 Diverging Diamond Interchange (DDI)

This alternative analyzes a DDI modified to preserve thru access for Beardsley Road. The approximate geometric layout uses the design from the 75th Avenue TI DDI alternative, as shown in **Figure 2.5**.

The existing intersections operate at LOS C/E at westbound Beardsley Road and LOS C/C at eastbound Beardsley Road in the a.m. and p.m. peak hours. The queue length of northbound thru vehicles exceeds the capacity of the two northbound thru lanes over the bridge. The DDI is operationally promising with the addition of a third northbound thru lane across the bridge and extended through the westbound Beardsley Road intersection. The north and south legs of the DDI may conflict with driveway access points.

Figure 2.5 – 67th DDI Approximate Geometry



2.5.5 Continuous Flow Interchange (CFI)

This alternative analyzes two variations of a CFI: crossing the southbound left turns at a new upstream signalized intersection and crossing the northbound left turns at the eastbound Beardsley Road intersection.

Southbound Lefts at Upstream Signalized Intersection

The goal of this scenario is to minimize intersection delays by making the southbound left movement free flow at the eastbound terminal. **Figure 2.6** shows the approximate geometric layout, with red arrows designating the southbound left bypass movement.
The new cross-over intersection north of the 67th Avenue TI and eastbound Beardsley Road are 2-phase intersections, while the westbound Beardsley Road intersection remains 3-phase.

Figure 2.6 – 67th SBL CFI Approximate Geometry

The upstream crossover intersection would likely alter access to one or more driveways. Approach capacity at the westbound Beardsley Road intersection is congruous with that of the no build alternative, which is forecasted to operate at LOS E/F in the 2040 a.m. and p.m. peak hours, respectively. Given these geometric and operational challenges, no further analysis was pursued for this scenario.

Northbound Lefts at Eastbound Terminal Intersection

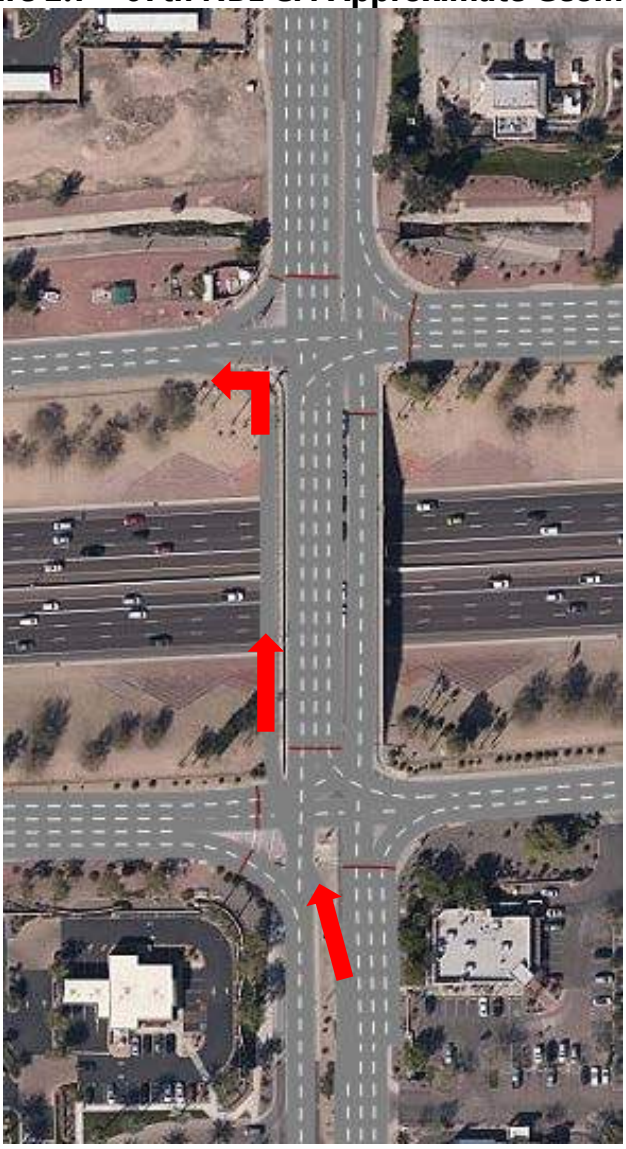
The goal of this scenario is to minimize intersection delays by making the northbound left movement free flow at the westbound Beardsley Road intersection, allowing that intersection to operate on a 2-phase signal. The existing number of lanes at each approach is preserved, with the addition of a second right turn lane at both the eastbound and northbound approaches to the eastbound Beardsley Road intersection.

Figure 2.7 shows the approximate geometric layout, with red arrows designating the northbound left bypass movement.

The existing intersections operate at LOS B/E at westbound Beardsley Road and LOS C/D at eastbound Beardsley Road in the 2040 a.m. and p.m. peak hours, respectively. Operations are hindered by the long all-red time required to accommodate the large clearance interval for the northbound left crossover movement. Additionally, the queue length of southbound thru vehicles exceeds the capacity of the two southbound thru lanes over the bridge. The increased delays and potential for gridlock as a result of this queue overflow are not fully captured in the intersection LOS.

This scenario is operationally promising with an additional southbound thru lane to reduce the southbound queue length across the bridge.

Figure 2.7 – 67th NBL CFI Approximate Geometry



3.0 Conclusion

Four concepts at the SR-101L/67th Avenue TI were identified and evaluated during the study: (1) a diamond interchange with three southbound left turn lanes, (2) dual roundabouts, (3) a DDI, and (4) a continuous flow interchange (CFI). It is recommended that the planning partners further analyze the SR-101L/67th Avenue TI in a standalone study to develop, refine, and evaluate TI improvements.

Table 9 summarizes the results of operational analysis for each alternative.

Table 9: Summary of Alternatives

Alternative	Cost	Operations
Southbound Triple Left Turn (Ramp Braid)	$40.1M	• Feasible. Achieves passing LOS. • Required bridge widening for one additional turn lane.
Roundabouts	-	• Insufficient gaps for EB/WB movements to enter the circles. • Insufficient SB lane capacity entering northern intersection.
DDI (Ramp Braid)	-	• Operationally promising if bridge is widened for multiple lanes. • Access concerns. • Warrants further consideration.
CFI	-	• Excess SB queuing on the bridge.

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L
SEGMENT: 67th Ave TI
LENGTH:
ADOT PROJECT NO.:
PROJECT DESCRIPTION: Triple Lefts
ESTIMATE LEVEL: Level 0
DATE: 12/20/19

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	$ 231,000.00	231,000
	ROADWAY EXCAVATION	CU.YD.	41,000	$ 20.00	820,000
	DRAINAGE EXCAVATION	CU.YD.		$ 8.00	
	BORROW	CU.YD.		$ 16.00	
	SUBGRADE TREATMENT	SQ.YD.		$ 15.00	
	FURNISH WATER	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 200				1,051,000
300 & 400	**BASE AND SURFACE TREATMENT**				
	AGGREGATE BASE	SQ.YD.	37,642	$ 10.00	376,420
	CONCRETE PAVEMENT	SQ.YD.	30,562	$ 62.00	1,894,870
	ASPHALT PAVEMENT	SQ.YD.	7,080	$ 34.00	240,710
	ARAC SURFACE	SQ.YD.		$ 6.00	
	MILLING & OVERLAY	SQ.YD.		$ 16.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 300 & 400				2,512,000
500	**DRAINAGE**				
	DRAINAGE SYSTEM (CLOSED)	L.FT.		$ 240.00	
	DRAINAGE SYSTEM (OPEN)	L.FT.		$ 185.00	
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.		$ 415.00	
	PUMP STATION (NEW)	EACH		$ 2,500,000.00	
	PIPE CULVERTS	L.FT.		$ 365.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 500				0
600	**STRUCTURES**				
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.	27,846	$ 135.00	3,759,210
	FLYOVER HOV RAMP	SQ.FT.		$ 175.00	
	OVERPASS TI BRIDGE	SQ.FT.		$ 140.00	
	RIVER CROSSING BRIDGE	SQ.FT.		$ 145.00	
	PEDESTRIAN BRIDGE	SQ.FT.		$ 180.00	
	BRIDGE WIDENING	SQ.FT.		$ 160.00	
	BRIDGE REHABILITATION	SQ.FT.		$ 100.00	
	BOX CULVERT	L.FT./CELL		$ 1,330.00	
	SIGN STRUCTURES	EACH		$ 100,000.00	
	ITS STRUCTURE AND PANEL	EACH		$ 200,000.00	
	O&M CROSSING	EACH		$ 350,000.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 600				3,759,210
700	**TRAFFIC ENGINEERING**				
	SIGNING (FREEWAY)	MILE/DIR	1.5	$ 35,000.00	52,500
	SIGNING (STREET)	MILE	0.75	$ 65,000.00	48,750
	PAVEMENT MARKING	LANE-MILE	4.00	$ 5,000.00	20,000
	LIGHTING	MILE	0.50	$ 375,000.00	187,500
	TRAFFIC SIGNAL	EACH		$ 250,000.00	
	INTELLIGENT TRANSPORTATION SYSTEM (ITS)	MILE		$ 525,000.00	
	MISCELLANEOUS ITEMS	L.SUM		$ 1,700,000.00	
	TOTAL ITEM 700				308,750
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING AND TOPSOIL	SQ.YD.		$ 15.00	
	UTILITY RELOCATION	L.SUM	1	$ 1,000,000.00	1,000,000
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 800				1,000,000
900	**INCIDENTALS**				
	RETAINING WALLS	SQ.FT.	81,000	$ 75.00	6,075,000
	SOUND WALLS	SQ.FT.	41,250	$ 40.00	1,650,000
	ROADWAY APPURTENANCES	L.SUM	1	$ 500,000.00	500,000
	ADA IMPROVEMENTS	EACH		$ 2,500.00	
	TRANSIT APPURTENANCES	L.SUM			
	RAILROAD ACCOMMODATIONS	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 900				8,225,000
	SUBTOTAL A (ITEM SUBTOTAL)				**$16,856,000**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L **PROJECT DESCRIPTION:** Triple Lefts
SEGMENT: 67th Ave TI **ESTIMATE LEVEL:** Level 0
LENGTH: **ADOT PROJECT NO.:** **DATE:** 12/20/19

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
PW	**PROJECT WIDE**				
	TRAFFIC CONTROL (8% OF SUBTOTAL A)			8.0%	1,348,500
	DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER)			0.0%	0
	QUALITY CONTROL (1% OF SUBTOTAL A)			1.0%	168,600
	CONSTRUCTION SURVEYING (1.5% OF SUBTOTAL A)			1.5%	252,800
	EROSION CONTROL (1% OF SUBTOTAL A)			1.0%	168,600
	MOBILIZATION (8% OF SUBTOTAL A)			8.0%	1,348,500
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)			20.0%	3,371,200
	SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)				**$23,514,200**
OTHER PROJ	**OTHER PROJECT COSTS**				
	DPS TRAFFIC CONTROL				0
	JOINT PROJECT AGREEMENT ITEMS				0
	CONTRACTOR INCENTIVES				0
	ENVIRONMENTAL MITIGATION	MILE	1	1,000,000	1,000,000
	PRESENT YEAR CONSTRUCTION BID COST (EXCLUDING UTILITIES & R/W)				**$24,514,200**
INFL	**INFLATION AND BELOW THE LINE ITEMS**				
	LABOR AND MATERIAL INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			NOT INCLUDED	0
	POST DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	245,100
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL A)			5.0%	1,225,700
	CONSTRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	1,961,100
	INDIRECT COST ALLOCATION (9.9% OF SUBTOTAL B + OTHER PROJECT COSTS)			9.90%	2,766,700
	CONSTRUCTION YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)				**$30,712,800**
DES	**PREDESIGN AND FINAL DESIGN**				
	PREDESIGN/NEPA/PI SERVICES (3% OF CONSTRUCTION YEAR COST)			3.0%	735,400
	FINAL DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST)			8.0%	1,961,100
	INDIRECT COST ALLOCATION (9.9% OF ALL DESIGN COSTS)			9.90%	267,000
	TOTAL ESTIMATED DESIGN COST				**$2,963,500**
UTIL	**UTILITY RELOCATION**				
	PRIOR RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS				0
	INDIRECT COST ALLOCATION (9.9% OF ALL UTILITY COSTS)			9.90%	0
	UTILITY RELOCATION COST INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	TOTAL ESTIMATED UTILITY COST				**$0**
R/W	**RIGHT-OF-WAY**				
	RIGHT-OF-WAY	L. SUM	1	5,850,000	5,850,000
	INDIRECT COST ALLOCATION (9.9% OF ALL RIGHT-OF-WAY COSTS)			9.90%	579,200
	RIGHT-OF-WAY PRICE ESCALATION TO ACQUISITION YEAR 20xx (X%/YR)			1.00	0
	ACQUISITION YEAR RIGHT-OF-WAY COSTS				**$6,429,200**
	TOTAL ESTIMATED PROJECT COST				**$40,106,000**

B&N
burgessniple.com

SR-101L/75th & 67th AVENUES SERVICE TRAFFIC INTERCHANGES
FEASIBILITY ANALYSIS
67TH AVENUE ALTERNATIVE A - THREE LEFTS

MARICOPA ASSOCIATION of GOVERNMENTS

Appendix C

Kickoff Meeting

SUMMARY

SR-101L/75th Avenue
Traffic Interchange Feasibility Study

Kickoff Meeting
October 23, 2019

ATTENDEES
See attached sign-in sheet.

HANDOUTS
Agenda, Existing and Future Turning Movement Counts.

Quinn Castro, MAG Project Manager, convened the meeting at 2:00 p.m.

1. INTRODUCTIONS
Jason Pagnard (Burgess & Niple) welcomed attendees and asked all participants to introduce themselves.

2. PROJECT OVERVIEW
Mr. Pagnard provided a brief overview of the project. He indicated that the purpose of the meeting was to discuss the study area constraints, operational and safety issues, and potential improvement alternatives development. Up to three conceptual alternatives would be identified for analysis, in addition to the no-build scenario. He continued by reviewing study scope elements, including:

- Obtaining traffic count data, crash data, relevant studies, and CAD files to establish baseline conditions;
- Performing existing and future conditions traffic operations analysis, including microsimulation, and safety assessment;
- Developing up to three conceptual alternatives for the SR-101L/75th Avenue Traffic Interchange (TI) and developing microsimulation model(s);
- Evaluating conceptual alternatives; and
- Preparing a technical memorandum to document study findings and presenting the findings at a Planning Partners meeting.

David Lenzer (Burgess & Niple) provided a description of the study area and identified site constraints created by the existing roadway configuration and surrounding development.

Ravi Ambadipudi (Burgess & Niple) provided an overview of traffic patterns and volumes near the project area. The TI's at 75th and 67th Avenues exhibit similar traffic movements and volumes. This traffic analysis was part of the SR-101L Northwest Area Intersections Traffic Analysis report prepared by Burgess & Niple for MAG in June 2019.

Dana Biscan (Burgess & Niple) confirmed that new crash data, through the end of 2018, would be obtained from ADOT, with the hope of resolving discrepancies in crash data identified in the aforementioned traffic report. Glendale has noted a significant number of fixed object crashes and night crashes from their own records.

3. STUDY AREA ISSUES AND ALTERNATIVES DEVELOPMENT

The most congested movement through the TI was identified as the southbound 75th to eastbound 101 left-turn movement. Queuing in the current dual left-turn lanes backs up into the TI's northern intersection during peak hours.

Mr. Pagnard proposed three left turn lanes as one of the alternatives. Chris Lemka (city of Peoria) agreed this scenario should be examined to identify impacts. The stakeholders agreed this alternative would include a 3-lane on-ramp. Debbie Albert (City of Glendale) noted that intersections with triple lefts exist elsewhere in Glendale.

As part of the first alternative, Mr. Pagnard suggested shifting the 75th eastbound on-ramp toward 67th using a braided ramp design to reduce friction while merging onto the mainline. Full access to the frontage road would be maintained. Mr. Lemka expressed interest in whether the braided ramp would require ramp metering and if the braided ramp would be feasible with only two left-turn lanes. Ms. Albert indicated that historically there has been difficulties obtaining public approval for projects with elevated strutures, citing the example of a pedestrian overpass.

Mr. Pagnard called attention to the TI's northern intersection, whose eastbound approach facilitates a high volume of right-turn movements. The existing intersection has one through-right lane and one right-turn lane, with right turns permitted on red. Ms. Albert emphasized the importance of maintaining access to the adjacent apartments, Laguna at Arrowhead Ranch.

Mr. Pagnard sought opinions on including a diverging diamond interchange (DDI) as one of the alternatives. A DDI would cut off through access to the frontage road, although the road would continue to be accessible from other access points. Tunneling or modifying the DDI would allow for continued through access to the frontage road. Through access to the eastbound frontage road would be cut off at 75th Avenue, unless

the frontage road was tunneled beneath the TI. Glendale stressed the importance of the frontage road to residents.

Ms. Albert noted that the vacant lot northwest of the project area will be developed into medical offices, pending permit approval.

Mr. Lenzer discussed a continuous flow intersection (CFI). Unlike a DDI, a CFI would reduce phasing but preserve frontage road through movements, at the cost of a larger right-of-way footprint. Tony Abbo (city of Glendale) expressed concern that this would inhibit access to the adjacent apartments.

Ms. Biscan asked the stakeholders to identify the major trade-offs inherent to redesigning the project area. Trade-offs included frontage road access, apartment access, and utilizing the existing bridge structure.

George Williams (ADOT) asked what problems the TI redesign would seek to address. Mr. Ambadipudi confirmed insufficient capacity and heavy congestion as the driving problems, with crash volumes as a secondary consideration.

Mr. Abbo proposed a flyover ramp to as an alternative to accommodate the southbound 75th to eastbound 101 left-turn movement. Mr. Williams wondered if 75th Avenue has sufficient upstream capacity to support a flyover. The project team will request a travel demand model (TDM) from MAG to identify the sources and purposes of southbound trips on 75th.

The stakeholders discussed the regional factors driving the congested traffic patterns. Mr. Lemka shared that Peoria residents have three access points to employment centers by way of the 101: Union Hills Drive, Beardsley Road, and 75th Avenue. High traffic arterials feeding into these access points include Happy Valley and Lake Pleasant Parkways.

Mr. Williams suggested considering other locations for the flyover to more effectively address regional needs. The project team will request a TDM from MAG with a modified connection between southbound Beardsley north of Union Hills and eastbound 101 to simulate the impacts of a flyover in that location.

The stakeholders discussed the under-utilized Texas U at Union Hills and the possibility of publicizing this route as an alternative to 75th by using signage or dynamic message boards.

SUMMARY

The stakeholders agreed on the following alternatives for the 101/75th TI, to be analyzed for feasibility and refined through preliminary traffic modelling:

1. Triple lefts – with braided ramp
2. Indirect / Displaced lefts (DDI/CFI) – with frontage road
3. Flyover

A flyover at 75th would have the potential to incorporate a single-point urban interchange (SPUI) on a new bridge.

The stakeholders briefly discussed the TI at 101 and 67th Avenue, which, while not within the direct project scope, exhibits the same traffic patterns as at 75th. In addition, there is a higher crash rate and more development access. Glendale has taken steps to mitigate known crash risks by adjusting signal timing and limiting driveway egress based on time of day.

The stakeholders agreed to conduct broad analysis for the following alternatives at the 67th TI:

1. Triple lefts
2. Indirect / Displaced lefts (DDI/CFI)
3. Roundabout

It was noted that any roundabouts implemented at this location would be the first in Glendale.

4. NEXT STEPS

Mr. Pagnard stated the project team will conduct preliminary analysis before confirming alternatives with the stakeholders. Mr. Pagnard thanked attendees for their participation.

Meeting was adjourned at 4:00 p.m.

SR-101L/75th Avenue
Traffic Interchange Feasibility Study

SIGN-IN SHEET

Kickoff Meeting
Wednesday, October 23, 2019
2:00 p.m.
Maricopa Association of Governments
Ironwood Conference Room

Initials	Name	Agency
	Adam Carreon	ADOT
	Clinton Emery	ADOT
	Dylan Cardie	ADOT
	George Williams	ADOT
	Sara Howard	ADOT
DAA	Debbie Albert	City of Glendale
PKA	Purab Adabala	City of Glendale
T.A.	Tony Abbo	City of Glendale
	Adina Lund	City of Peoria
CPL	Chris Lemka	City of Peoria
	Denise Lacey	MCDOT
JM	Jessica May	MCDOT
	John Bullen	MAG
QQC	Quinn Castro	MAG
WR	William Randolph	MAG
	Jason Pagnard	Burgess & Niple
DL	David Lenzer	Burgess & Niple
RA	Ravi Amabadipudi	Burgess & Niple
DB	Dana Biscan	Burgess & Niple
RF	Rachel Feeck	Burgess & Niple

SR-101L/75th Avenue

Traffic Interchange (TI) Feasibility Study

AGENDA

Kickoff Meeting

Wednesday, October 23, 2019
2:00 p.m.
Maricopa Association of Governments
Ironwood Conference Room

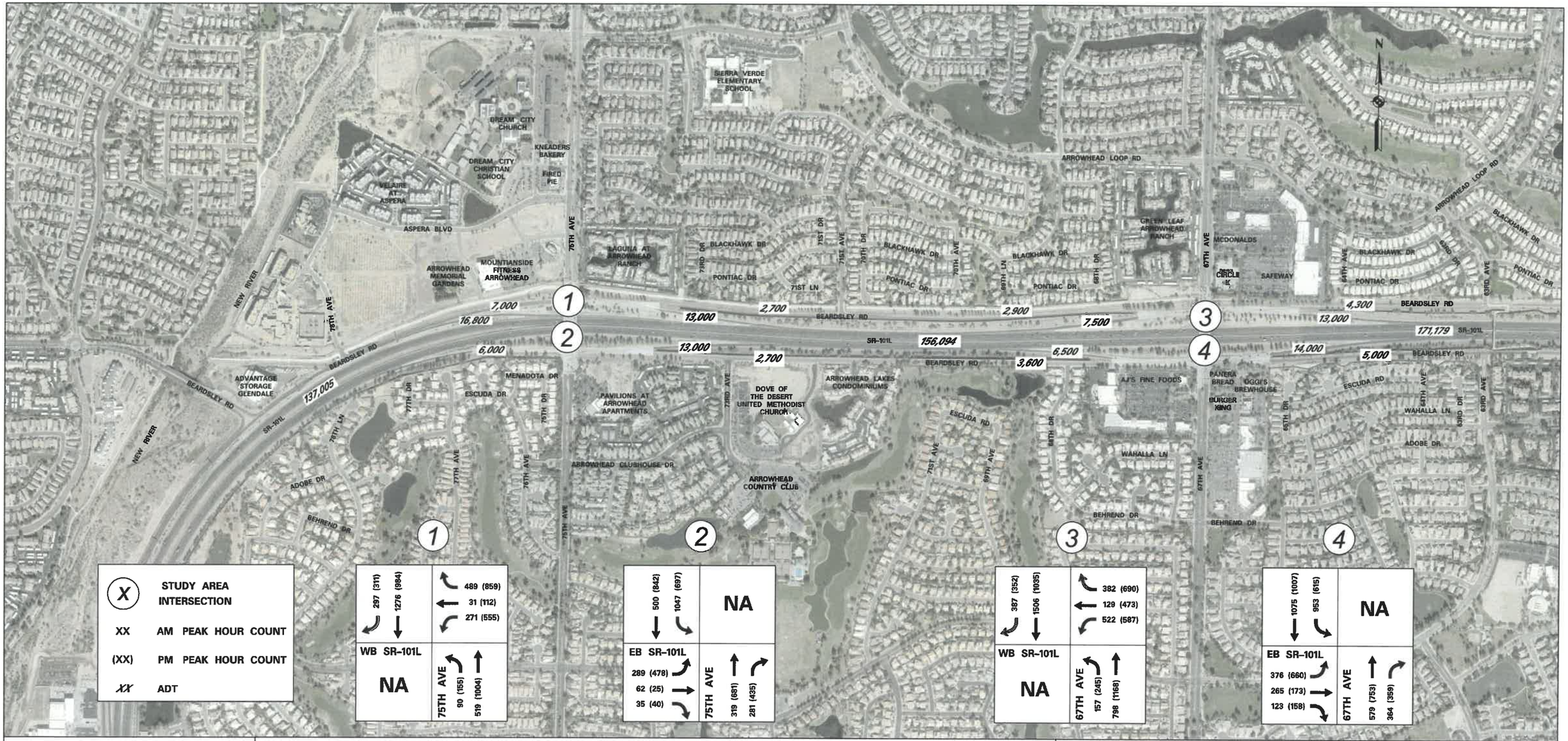
Meeting Purpose – Kickoff meeting that will engage ADOT, MAG, Maricopa County, City of Glendale, and City of Peoria in a discussion about the study's purpose and develop potential improvement alternatives to investigate.

1. Introductions

2. Project Overview
   Brief overview of the project scope, schedule, and study area.

3. Study Area Issues and Alternatives Development
   A facilitated discussion of the study area constraints, operational and safety issues, and potential improvement alternatives development. Up to three conceptual alternatives will be identified for analysis.

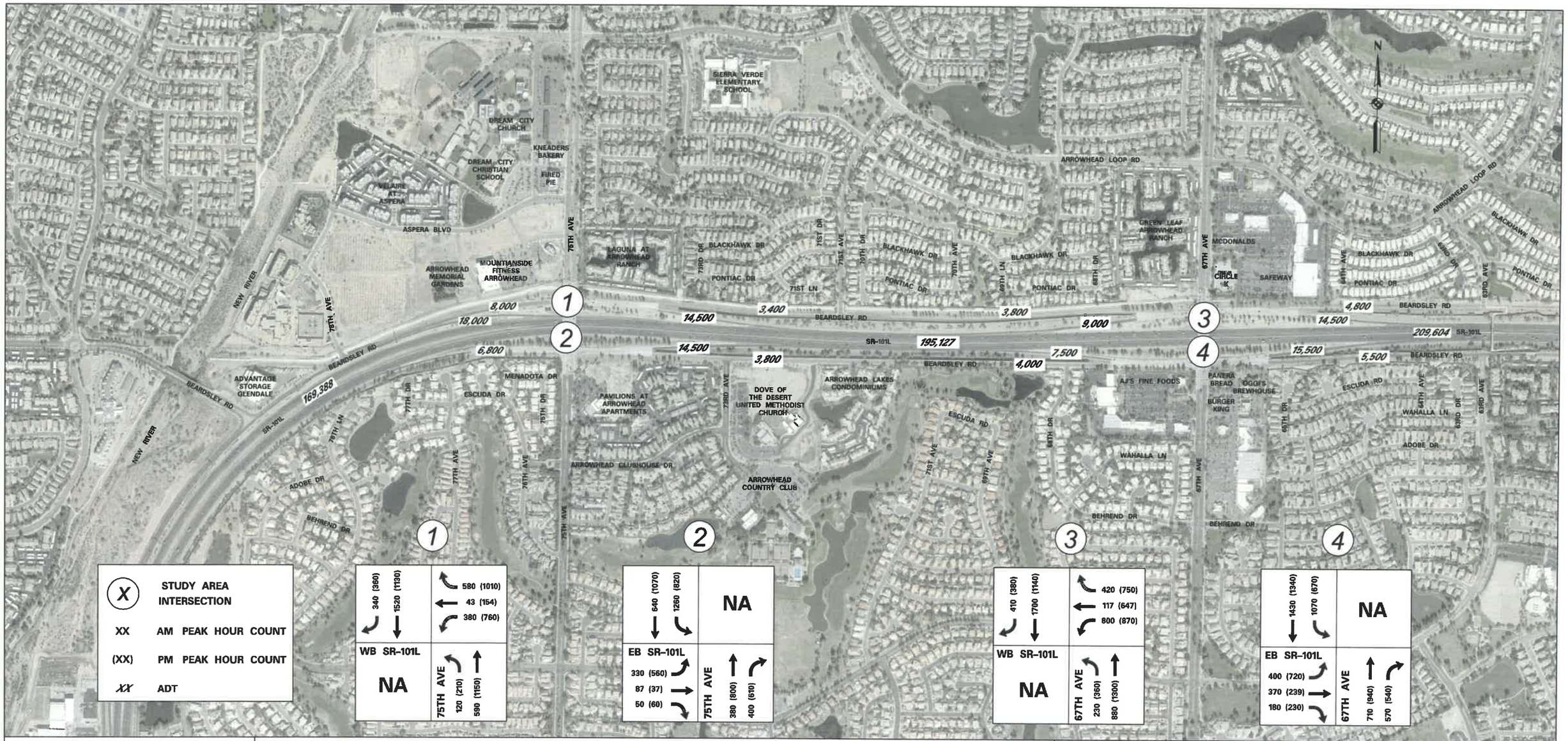
4. Next Steps
   Discussion of the next action items.



B&N
burgessniple.com

SR-101L/75TH AVENUE TI FEASIBILITY STUDY
EXISTING TURNING MOVEMENT COUNTS

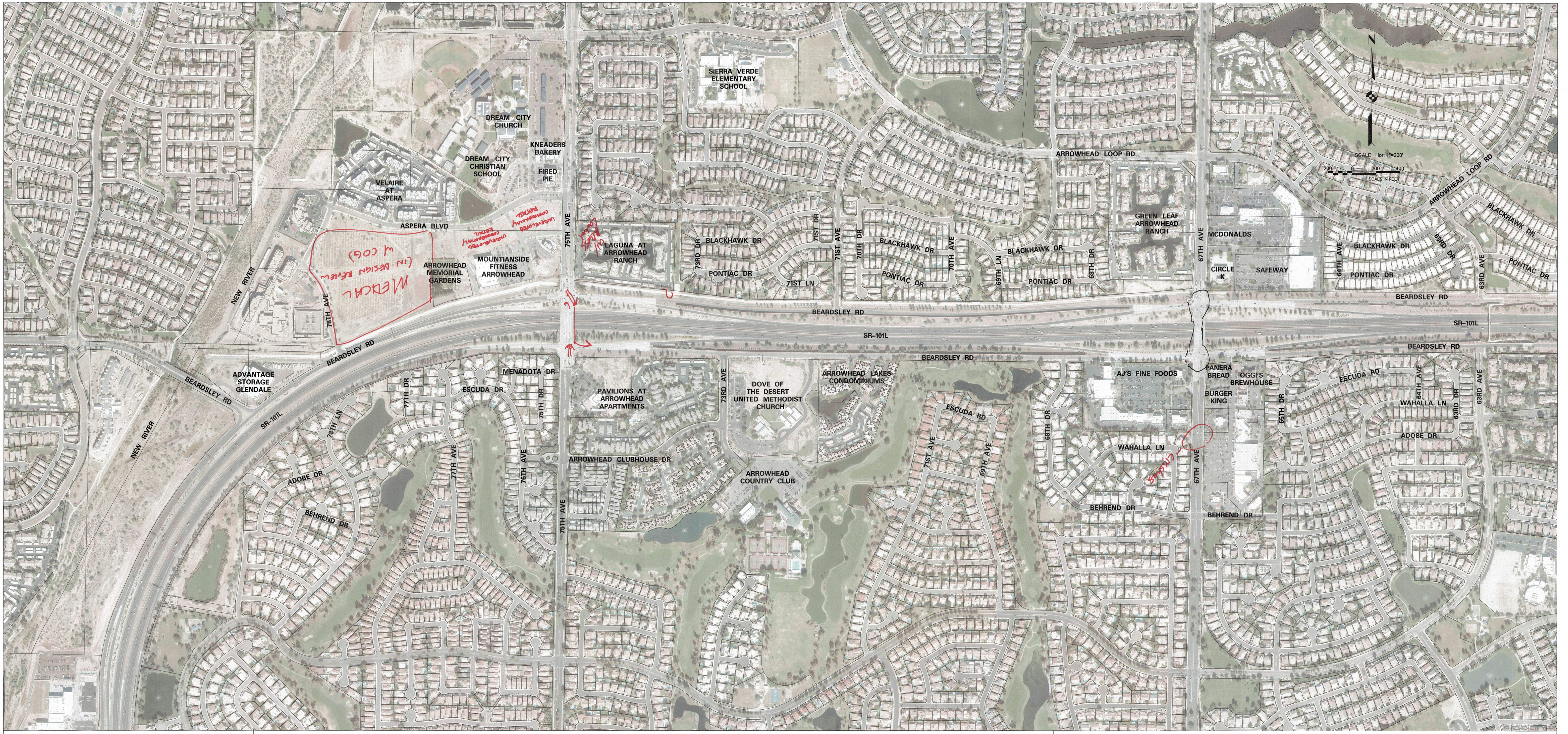
MARICOPA ASSOCIATION of GOVERNMENTS



B&N
burgessniple.com

SR-101L/75TH AVENUE TI FEASIBILITY STUDY
FUTURE TURNING MOVEMENT COUNTS

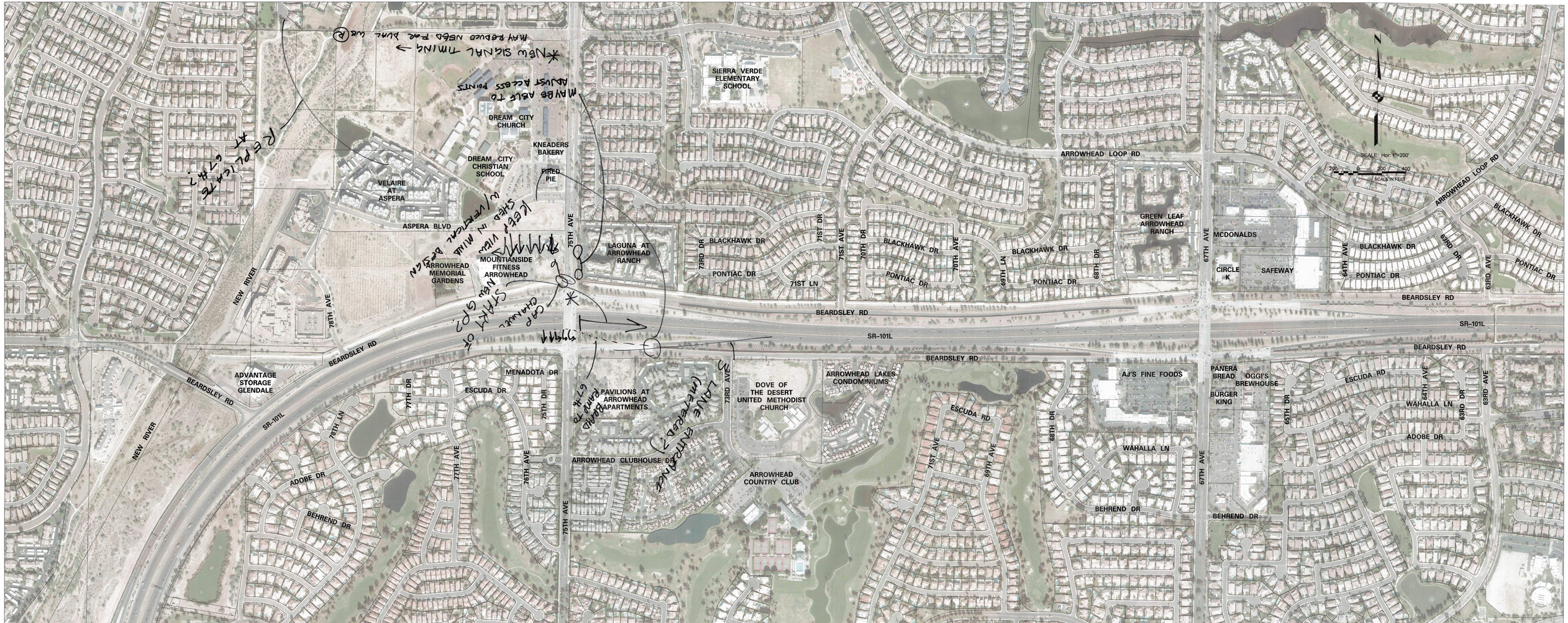
MARICOPA ASSOCIATION of GOVERNMENTS



SR–101L/75TH AVENUE TI FEASIBILITY STUDY

B&N
burgessniple.com

MARICOPA ASSOCIATION of GOVERNMENTS


SIERRA VERDE ELEMENTARY SCHOOL
DREAM CITY CHURCH
KNEADERS BAKERY
DREAM CITY CHRISTIAN SCHOOL
FIRED PIE
VELAIRE AT ASPERA
ASPERA BLVD
ARROWHEAD MEMORIAL GARDENS
MOUNTAINSIDE FITNESS ARROWHEAD
LAGUNA AT ARROWHEAD RANCH
ARROWHEAD LOOP RD
GREEN LEAF ARROWHEAD RANCH
MCDONALDS
CIRCLE K
SAFEWAY
BLACKHAWK DR
PONTIAC DR
BEARDSLEY RD
SR-101L
NEW RIVER
ADVANTAGE STORAGE GLENDALE
PAVILIONS AT ARROWHEAD APARTMENTS
DOVE OF THE DESERT UNITED METHODIST CHURCH
ARROWHEAD LAKES CONDOMINIUMS
ARROWHEAD CLUBHOUSE DR
ARROWHEAD COUNTRY CLUB
AJ'S FINE FOODS
PANERA BREAD
OGGI'S BREWHOUSE
BURGER KING
ESCUDA RD
WAHALLA LN
ADOBE DR
BEHREND DR
MENADOTA DR
75TH AVE
76TH AVE
77TH AVE
78TH LN
71ST AVE
73RD AVE
67TH AVE
68TH DR
69TH LN
70TH DR
71ST DR
73RD DR
63RD AVE
64TH AVE
65TH DR
68TH DR
SCALE: Hor. 1"=200'
SCALE IN FEET

Planning Partners Meeting

SUMMARY

SR-101L/75th Avenue
Traffic Interchange Feasibility Study

Kickoff Meeting
January 23, 2020

ATTENDEES
See attached sign-in sheet.

HANDOUTS
Agenda, Presentation.

Will Randolph, MAG Transportation Planner, convened the meeting at 9:30 a.m.

1. INTRODUCTIONS AND PROJECT OVERVIEW
Jason Pagnard (Burgess & Niple) welcomed attendees and asked all participants to introduce themselves.

David Lenzer (Burgess & Niple) provided a brief overview of the project. He indicated that the purpose of the meeting was to discuss the conceptual alternatives developed for the study area, as previously identified by the project partners. Conceptual alternatives were assessed though:

- Developing CAD linework;
- Utilizing microsimulation models;
- Preparing project cost estimates; and
- Identifying engineering opportunities and challenges.

David Lenzer (Burgess & Niple) reviewed the study area, highlighting the large number of on and off ramps along SR-101L.

2. TRAFFIC AND SAFETY ANALYSIS

Mr. Lenzer provided an overview of traffic patterns and volumes near the project area. Intersection operates at the 75th and 67th Avenue TI's are projected to degrade significantly under the future no build condition (2040). The TI's at 75th and 67th Avenues exhibit similar traffic movements and volumes. The 75th Avenue TI experiences high volumes and delays for both thru and left turn movements from the north and

south approaches. In addition to those movements, the 67th Avenue TI experiences high volumes and delays for left turns from the east and west approaches.

Dana Biscan (Burgess & Niple) presented the results of crash analysis within the study area. The 75th Avenue TI exhibits fewer high-severity crashes than the stae average, one pedestrian fatality, and a high number of rear end crashes indicative of congestion. The 67th Avenue TI exhibits one pedestrian fatality and a high number of angle crashes, which may be indicative of sight distance challenges.

Tony Abbo (Glendale) asked if the statewide averages used for comparison were urban or combined urban and rural statistics. Ms. Biscan confirmed the urban statewide averages were used when available. Mr. Abbo expressed interest in comparing the crash data of the study TI's with other intersections within the MAG region, if such data were available.

Project partners expressed interest in including a predictive crash analysis for the 75th and 67th Avenue TI's in future projects, such as a DCR.

3. SR101L/75TH AVENUE TI ALTERNATIVES OVERVIEW

Mr. Lenzer presented the five alternatives analyzed for the 75th Avenue TI, which are summarized below.

Alternative	Cost	Operations
Southbound Triple Left Turn (Ramp Braid)	$36.7M	Braids 75th EB on ramp and 67th EB off ramp.
DDI (Ramp Braid)	$43.9M	Braids 75th EB on ramp and 67th EB off ramp.
Flyover from 75th Ave	$43.8M	Introduces weave on frontage road.
Flyover from Beardsley Rd	-	Requires work from Union Hills to 75th.
Southbound Triple Left Turn (Relocate EB 67th TI Off Ramp)	$25.8M	Combines 75th and 67th TI EB off ramps.

The goals of each alternative were to improve traffic operations, preserve through movement on the frontage road, and accommodate a future SR-101L GPL addition. Secondary considerations included reconfiguring the interchange, salvaging the existing bridge, adding lanes, and changing access to nearby facilities.

For the fifth alternative, Mr. Abbo voiced concerns over public attitude toward relocating the eastbound 67th Avenue off ramp.

Debbie Albert (Glendale) inquired as to the elevation of the braided ramp proposed in the first and second alternatives. Mr. Lenzer indicated the braided ramp elevation would match that of the adjacent frontage road.

Mr. Abbo inquired as to the impacts of each alternative on access to the adjacent apartment complex. Mr. Lenzer confirmed both southbound triple left turn alternatives and the flyover would have no impacts, but the DDI may impose some access restrictions.

4. SR101L/67TH AVENUE TI ALTERNATIVES OVERVIEW

Mr. Lenzer presented the four alternatives analyzed for the 67th Avenue TI, which are summarized below.

Alternative	Cost	Operations
Southbound Triple Left Turn (Ramp Braid)	$40.1M	Feasible. Achieves passing LOS. Required bridge widening for one additional turn lane.
Roundabouts	-	Insufficient gaps for EB/WB movements to enter the circles. Insufficient SB lane capacity entering northern intersection.
DDI (Ramp Braid)	-	Operationally promising if bridge is widened for multiple lanes. Access concerns. Warrants further consideration.
CFI	-	Excess SB queuing on the bridge.

The goals of each alternative were to improve traffic operations, preserve through movement on the frontage road, and accommodate a future SR-101L GPL addition. Secondary considerations included reconfiguring the interchange, salvaging the existing bridge, adding lanes, and changing access to nearby facilities.

Ms. Albert asked if any of the alternatives at 75th Avenue can be implemented with the southbound left turn alternative at 67th Avenue. Mr. Lenzer confirmed that not all of the alternatives are mutually exclusive. Further detail will be provided in the report.

5. NEXT STEPS

Mr. Lenzer stated the project team will complete the alternatives analysis report to be circulated for review. The team and project partners will select a preferred alternative, and the project partners will discuss any next steps regarding further studies for the 67th Avenue TI.

Adina Lund (Peoria) indicated that future investigations of the 67th Avenue TI are important to Peoria.

Meeting was adjourned at 11:00 a.m.

SR-101L/75th Avenue
Traffic Interchange Feasibility Study

SIGN-IN SHEET

Planning Partners Meeting

Thursday, January 23, 2020
9:30 a.m.
Maricopa Association of Governments
Ironwood Conference Room

Initials	Name	Agency
	Clinton Emery	ADOT
	Dylan Cardie	ADOT
SH	Sara Howard	ADOT
JV	Joselyn Valero	ADOT
DAA	Debbie Albert	City of Glendale
PKA	Purab Adabala	City of Glendale
TA	Tony Abbo	City of Glendale
√(PHONE)	Adina Lund	City of Peoria
	Chris Lemka	City of Peoria
	Denise Lacey	MCDOT
JM	Jessica May	MCDOT
	John Bullen	MAG
QQC	Quinn Castro	MAG
WR	William Randolph	MAG
JP	Jason Pagnard	Burgess & Niple
DL	David Lenzer	Burgess & Niple
	Ravi Amabadipudi	Burgess & Niple
DB	Dana Biscan	Burgess & Niple
RF	Rachel Feeck	Burgess & Niple

SR-101L/75th Avenue

Traffic Interchange (TI) Feasibility Study

AGENDA

Planning Partners Meeting

Thursday, January 23, 2020
9:30 a.m.
Maricopa Association of Governments
Ironwood Conference Room

Meeting Purpose – The study team will present to the Planning Partners the various alternatives developed for the SR101L/75th Avenue and 67th Avenue traffic interchanges.

1. Introductions and Project Overview

2. Traffic and Safety Analysis
   Overview of existing traffic conditions and crash analyses.

3. SR101L/75th Avenue TI Alternatives Overview
   - Southbound Triple Left Turn Alternative–Braided Ramp
   - DDI Alternative
   - Flyover from 75th Ave Alternative
   - Triple Lefts Alternative–67th Ramp Relocation
   - Flyover from Beardsley Ave Alternative

4. SR101L/67th Ave TI Alternatives Overview
   - Southbound Triple Left Turn Alternative
   - Roundabouts Alternative
   - DDI Alternative
   - CFI Alternative

5. Next Steps
   Discussion of the next action items.

SR-101L/75th Avenue Traffic Interchange Feasibility Study

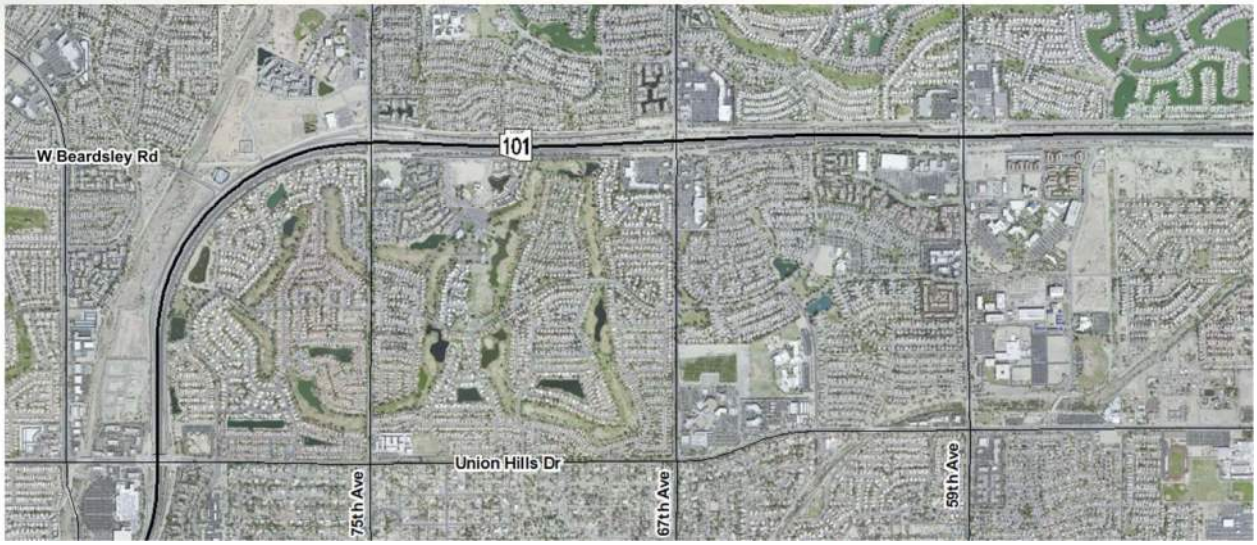
Planning Partners Meeting
January 23, 2020

Study Goals and Objectives

- Develop conceptual alternatives for the SR-101L/75th Avenue Traffic Interchange area.
- Assess conceptual alternatives through:
  - Developing CAD linework;
  - Utilizing microsimulation models;
  - Preparing project cost estimates; and
  - Identifying engineering opportunities and challenges.

© 2019, All Rights Reserved.

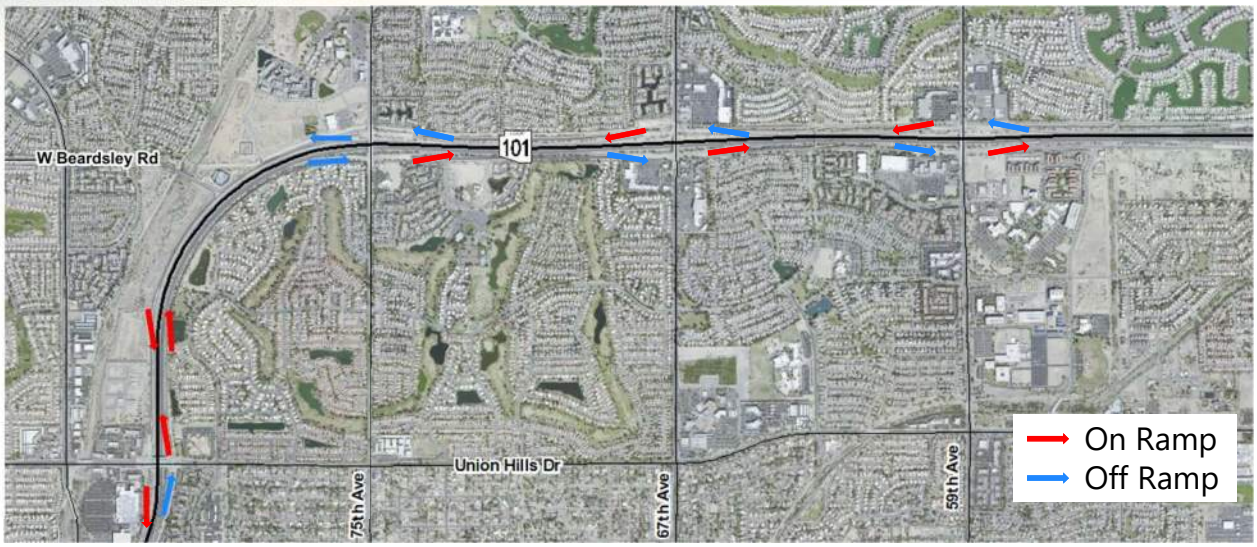
Project Overview



MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 3

Project Overview



MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 4

Existing and Future ADT

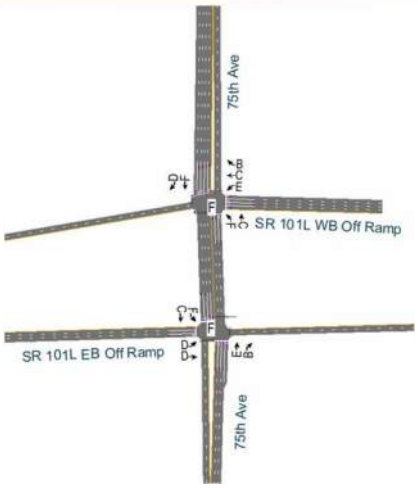
© 2019, All Rights Reserved.

Traffic LOS

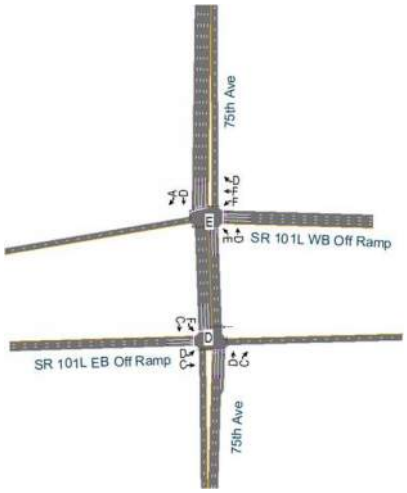
Intersection	Existing Overall LOS		2040 No Build LOS	
	a.m.	p.m.	a.m.	p.m.
75th Ave & SR-101L WB Ramp Terminal	E	D	F	E
75th Ave & SR-101L EB Ramp Terminal	F	D	F	D
67th Ave & SR-101L WB Ramp Terminal	D	F	E	F
67th Ave & SR-101L EB Ramp Terminal	D	E	F	F
Note: Results use Synchro's built-in methodology to determine LOS.				

© 2019, All Rights Reserved.

Traffic LOS: 75th Avenue TI – No Build 2040



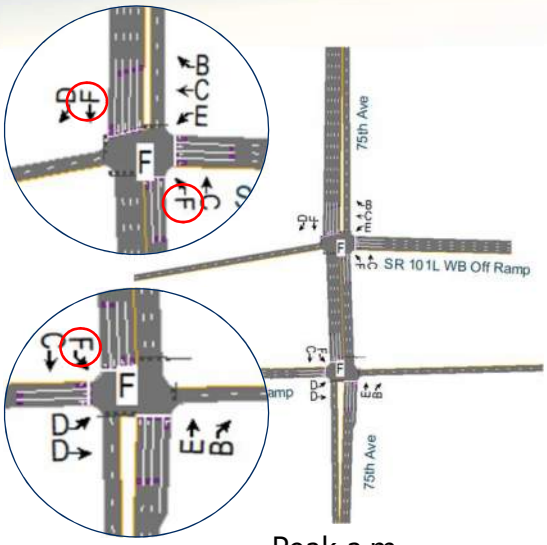
Peak a.m.



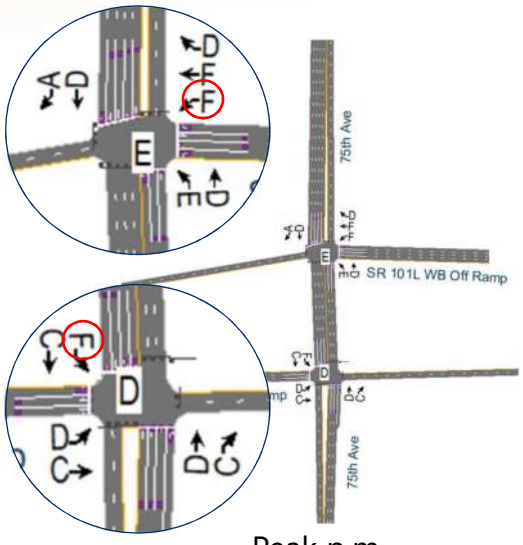
Peak p.m.

© 2019, All Rights Reserved.

Traffic LOS: 75th Avenue TI – No Build 2040



Peak a.m.



Peak p.m.

© 2019, All Rights Reserved.

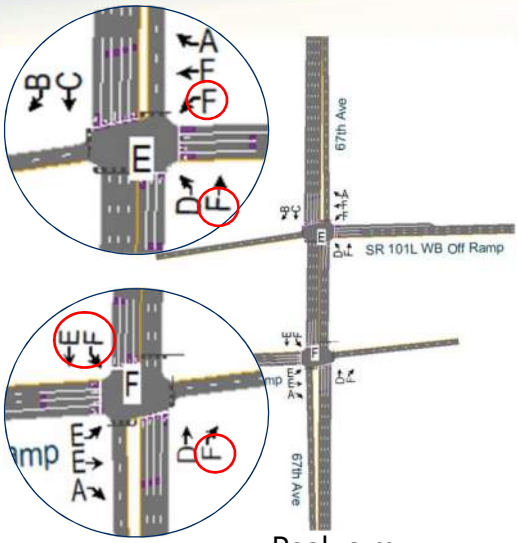
Traffic LOS: 67th Avenue TI – No Build 2040

Peak a.m.

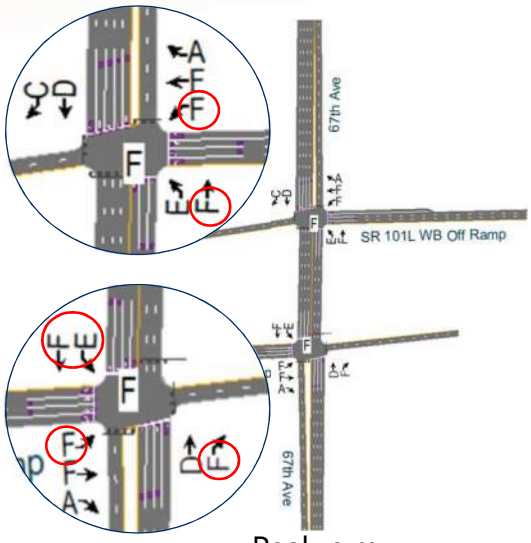
Peak p.m.

© 2019, All Rights Reserved.

Traffic LOS: 67th Avenue TI – No Build 2040



Peak a.m.



Peak p.m.

© 2019, All Rights Reserved.

Crash Analysis

75th Avenue TI

75th Avenue TI Crash Severity 2014-2018			
Crash Severity	Number	Percent	2018 Statewide Urban Average
Property Damage Only	160	78.4%	70.6%
Injury	43	21.1%	28.7%
Fatal	1	0.5%	0.7%
Grand Total	204	100.0%	100.0%

- Rear-end and fixed object crashes roughly 1.5 times higher than statewide averages
- Rear-end collisions indicative of congestion
- 1 pedestrian fatality

MARICOPA ASSOCIATION of GOVERNMENTS

Crash Analysis

67th Avenue TI

67th Avenue TI Crash Severity 2014-2018			
Crash Severity	Number	Percent of Total	2018 Statewide Urban Average
Property Damage Only	292	80.2%	70.6%
Injury	71	19.5%	28.7%
Fatal	1	0.3%	0.7%
Grand Total	364	100.0%	100.0%

- Angle crashes 1.5 times statewide average, left-turn and sideswipe same direction over-represented.
- 1 pedestrian fatality

MARICOPA ASSOCIATION of GOVERNMENTS

Alternatives Analysis

75th Avenue TI

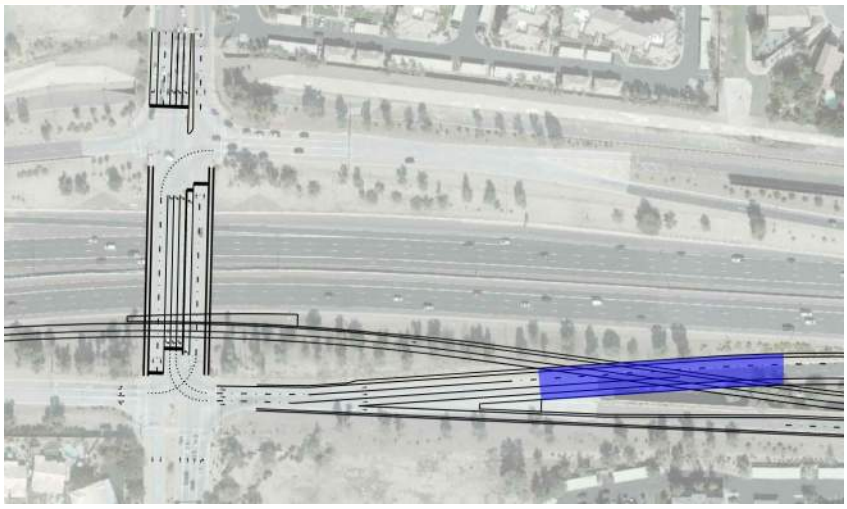
- Alternatives Considered:
  - Southbound Triple Left Turn;
  - DDI with maintained frontage road movement;
  - Flyover from southbound 75th Avenue to eastbound SR-101L; and
  - Flyover from eastbound Beardsley Avenue to eastbound SR-101L.
- Goals:
  - Improve traffic operations;
  - Preserve through movement on frontage road; and
  - Accommodate future SR-101L GPL addition.
- Flexible Considerations:
  - Reconfigure interchange;
  - Salvage existing bridge;
  - Add lanes; and
  - Change nearby access.

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 13

75th Ave TI

Southbound Triple Left Turn Alternative (Braided Ramp)



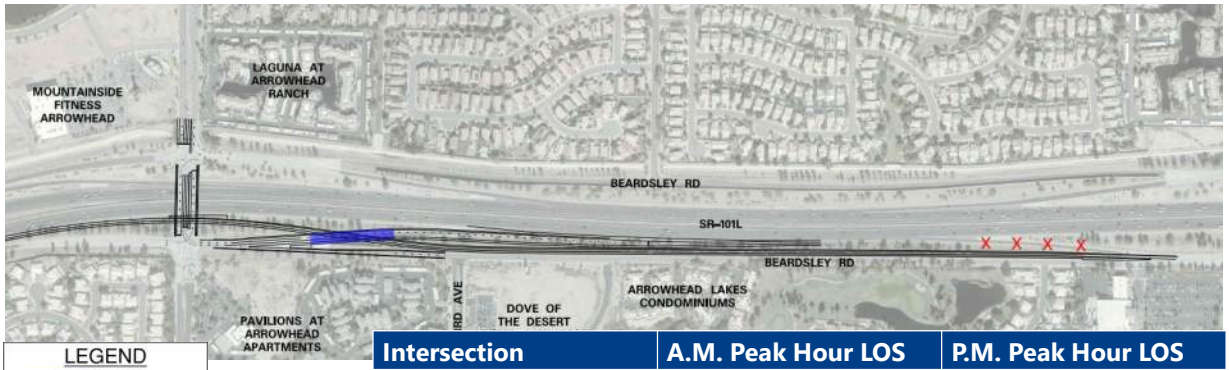
MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 14

75th Ave TI

Southbound Triple Left Turn Alternative (Braided Ramp)

Project Cost (Engineering, Construction, ROW, Utilities) - $36.7M



Intersection	A.M. Peak Hour LOS	P.M. Peak Hour LOS
75th Ave & WB Ramp	C	C
75th Ave & EB Ramp	C	C

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 15

75th Ave TI

DDI Alternative

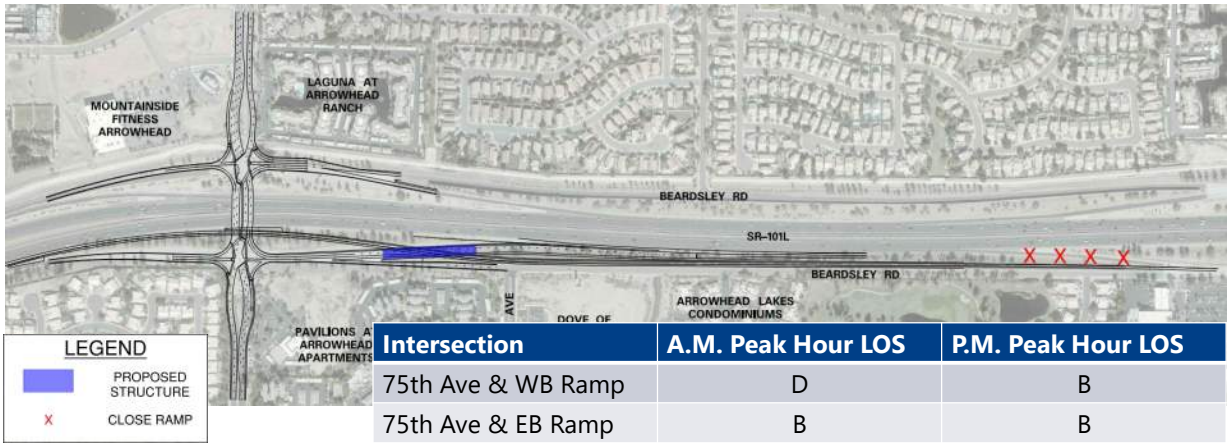
MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 16

75th Ave TI

DDI Alternative

Project Cost (Engineering, Construction, ROW, Utilities) - $43.9M



Intersection	A.M. Peak Hour LOS	P.M. Peak Hour LOS
75th Ave & WB Ramp	D	B
75th Ave & EB Ramp	B	B

© 2019, All Rights Reserved. 17

75th Ave TI

Flyover from 75th Ave Alternative

© 2019, All Rights Reserved. 18

75th Ave TI

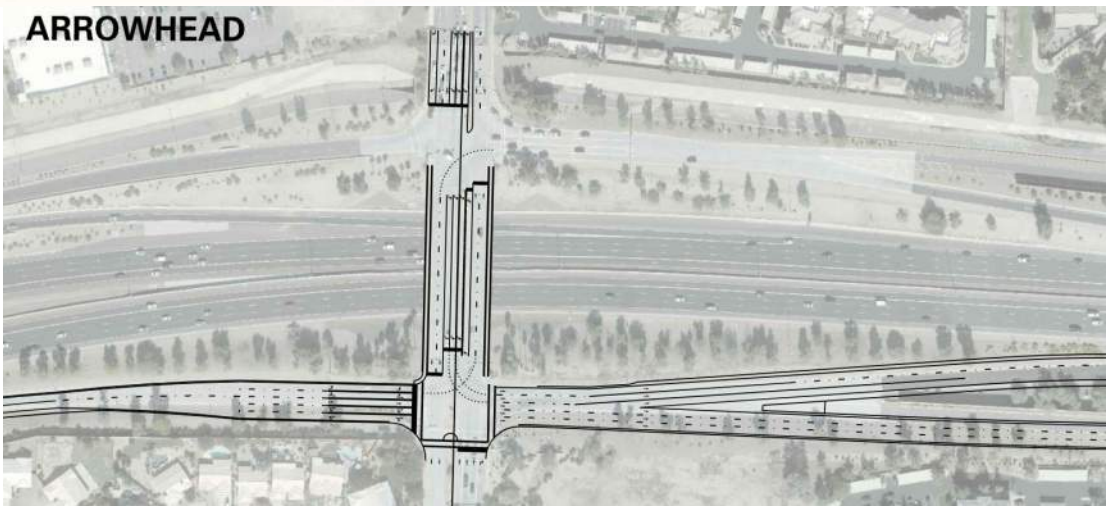
Flyover from 75th Ave Alternative
Project Cost (Engineering, Construction, ROW, Utilities) - $43.8M

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved.

75th Ave TI

Southbound Triple Left Turn Alternative (67th Ramp Relocation)



MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved.

75th Ave TI

Southbound Triple Left Turn Alternative (67th Ramp Relocation)
Project Cost (Engineering, Construction, ROW, Utilities) - $25.9M

LEGEND
PROPOSED STRUCTURE
CLOSE RAMP

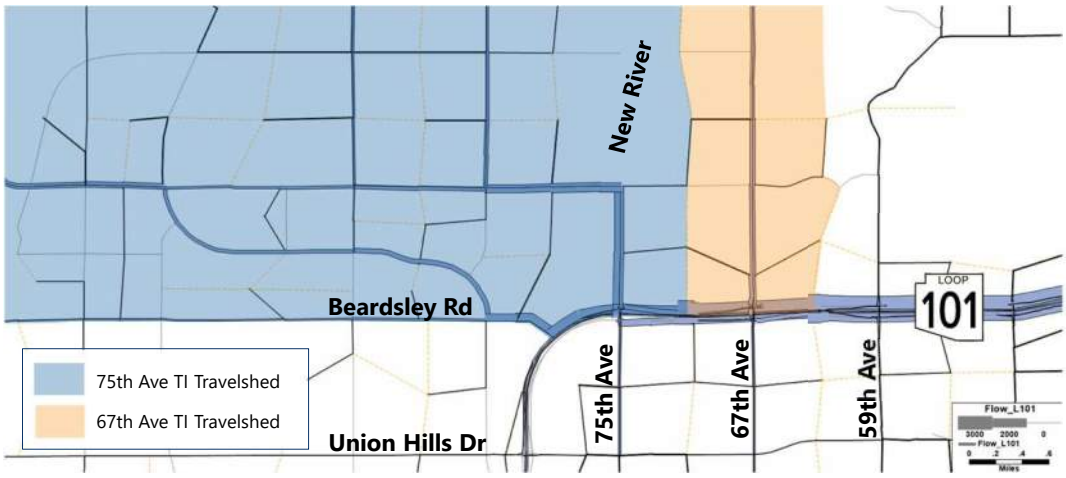
Intersection	A.M. Peak Hour LOS	P.M. Peak Hour LOS
75th Ave & WB Ramp	C	C
75th Ave & EB Ramp	C	C

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 21

75th Ave TI

Flyover - Travelshed

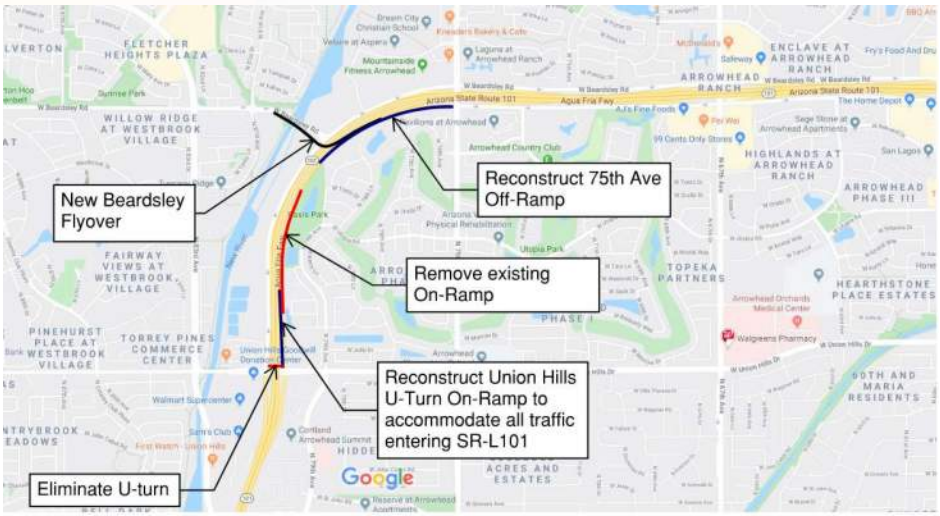


MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 22

75th Ave TI

Flyover from Beardsley Alternative



MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 23

75th Ave TI

Summary of Alternatives

Alternative	Cost	Operations
Southbound Triple Left Turn (Ramp Braid)	$36.7M	Braids 75th EB on ramp and 67th EB off ramp.
DDI	$43.9M	Braids 75th EB on ramp and 67th EB off ramp.
Flyover from 75th Ave	$43.8M	Introduces weave on frontage road.
Flyover from Beardsley Rd	-	Requires work from Union Hills to 75th
Southbound Triple Left Turn (Relocate EB 67th TI Off Ramp)	$25.8M	Combines 75th and 67th TI EB off ramps.

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 24

Alternatives Analysis

67th Avenue TI

- Alternatives Considered:
  - Southbound Triple Left Turn;
  - Roundabouts;
  - DDI with maintained frontage road movement; and
  - CFI (aka Paraflow).
- Goals:
  - Improve traffic operations;
  - Preserve through movement on frontage road; and
  - Accommodate future SR-101L GPL addition.
- Flexible Considerations:
  - Reconfigure interchange;
  - Salvage existing bridge;
  - Add lanes; and
  - Change nearby access.

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 25

67th Ave TI

Southbound Triple Left Turn Alternative

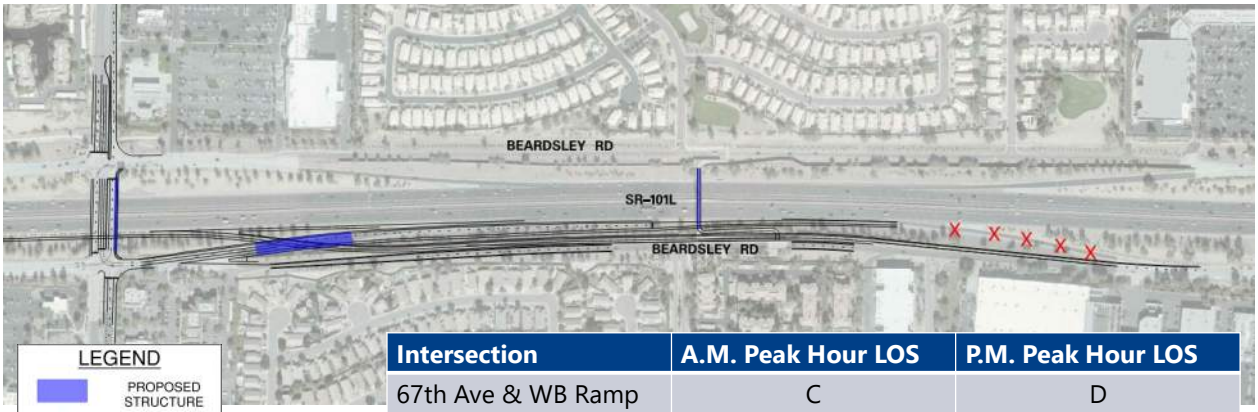
MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 26

67th Ave TI

Southbound Triple Left Turn Alternative

Project Cost (Engineering, Construction, ROW, Utilities) - $40.1M



Intersection	A.M. Peak Hour LOS	P.M. Peak Hour LOS
67th Ave & WB Ramp	C	D
67th Ave & EB Ramp	C	C

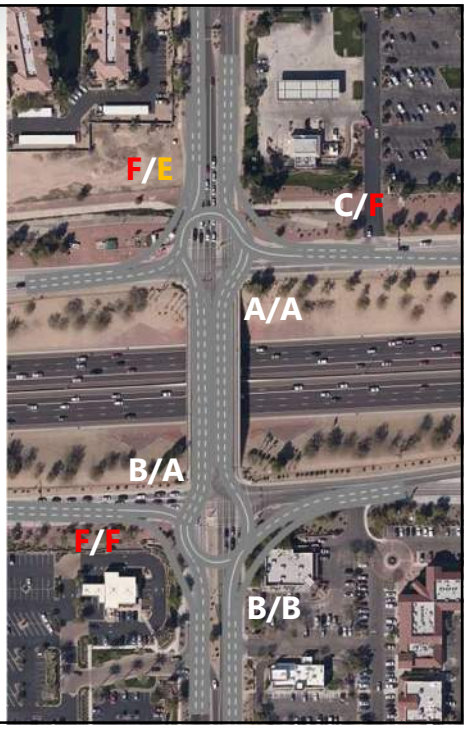
MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved. 27

67th Ave TI

Roundabouts Alternative

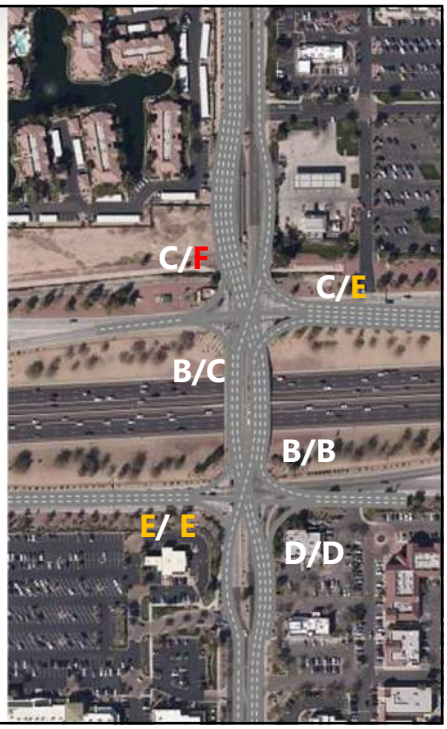
Intersection	A.M. Peak Hour LOS	P.M. Peak Hour LOS
67th Ave & WB Ramp	E	F
67th Ave & EB Ramp	F	F



MARICOPA ASSOCIATION of GOVERNMENTS

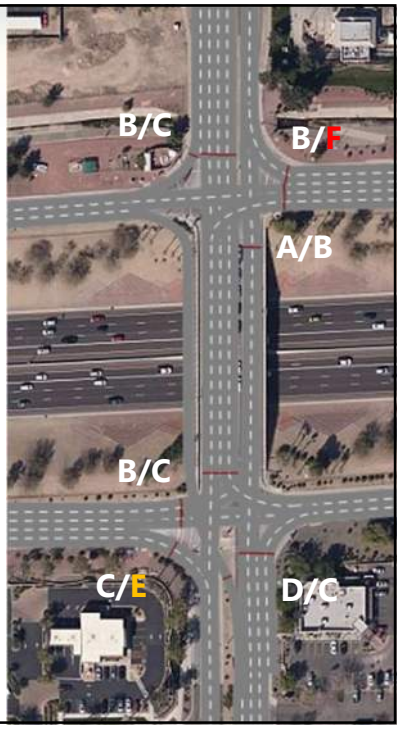
67th Ave TI
DDI Alternative

Intersection	A.M. Peak Hour LOS	P.M. Peak Hour LOS
67th Ave & WB Ramp	C	E
67th Ave & EB Ramp	C	C



67th Ave TI
CFI Alternative

Intersection	A.M. Peak Hour LOS	P.M. Peak Hour LOS
67th Ave & WB Ramp	B	E
67th Ave & EB Ramp	C	D



67th Ave TI

Summary of Alternatives

Alternative	Cost	Operations
Southbound Triple Left Turn (Ramp Braid)	$40.1M	Feasible. Achieves passing LOS. Requires bridge widening for one additional turn lane.
Roundabouts	-	Insufficient gaps for EB/WB movements to enter the circles. Insufficient SB lane capacity entering northern intersection.
DDI (Ramp Braid)	-	Operationally promising if bridge is widened for multiple lanes. Access concerns. Warrants further consideration.
CFI	-	Excess SB queuing on the bridge.

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved.

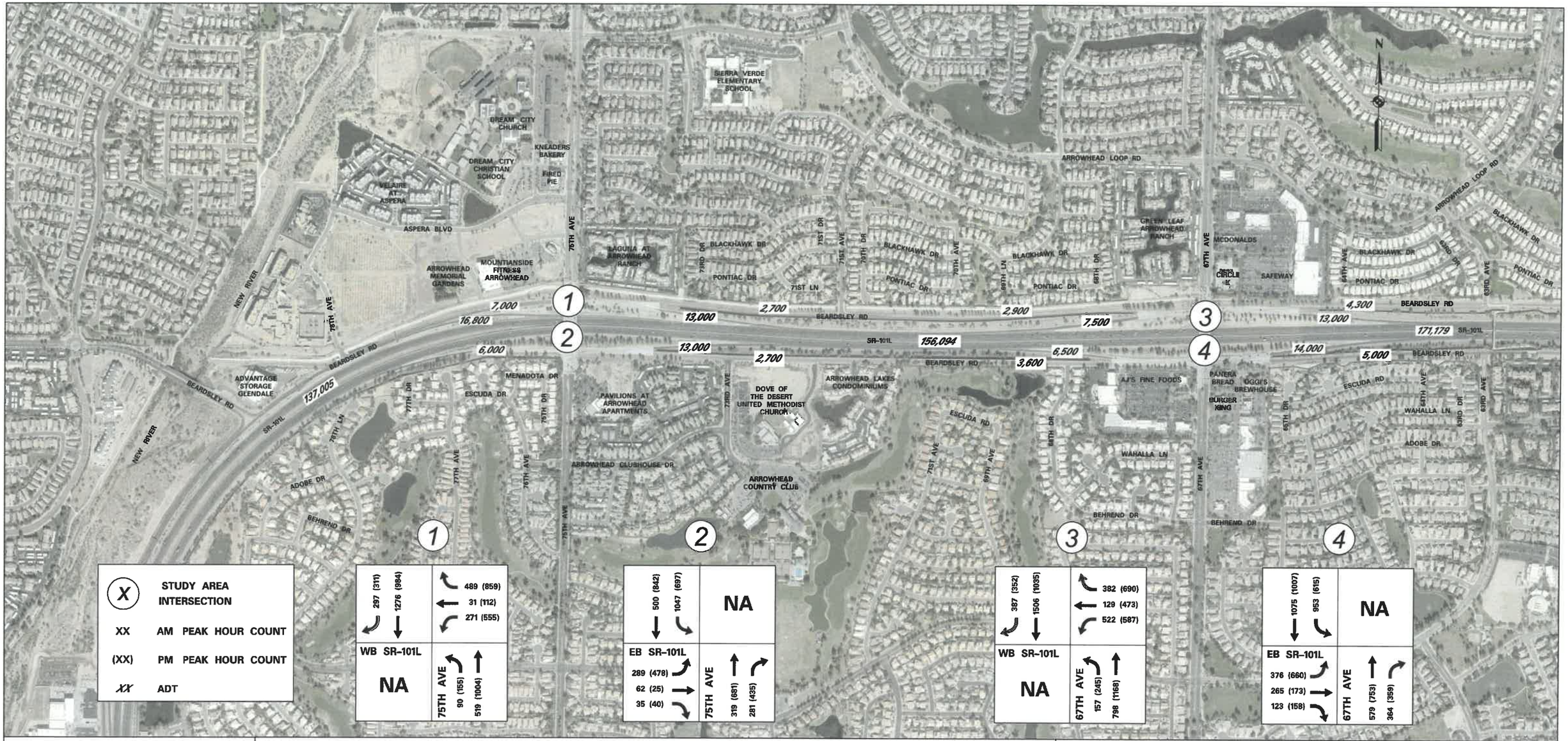
Next Steps

- Complete report and circulate for review.
- Select preferred alternative.
- Discuss next steps for 67th Ave TI.

MARICOPA ASSOCIATION of GOVERNMENTS

© 2019, All Rights Reserved.

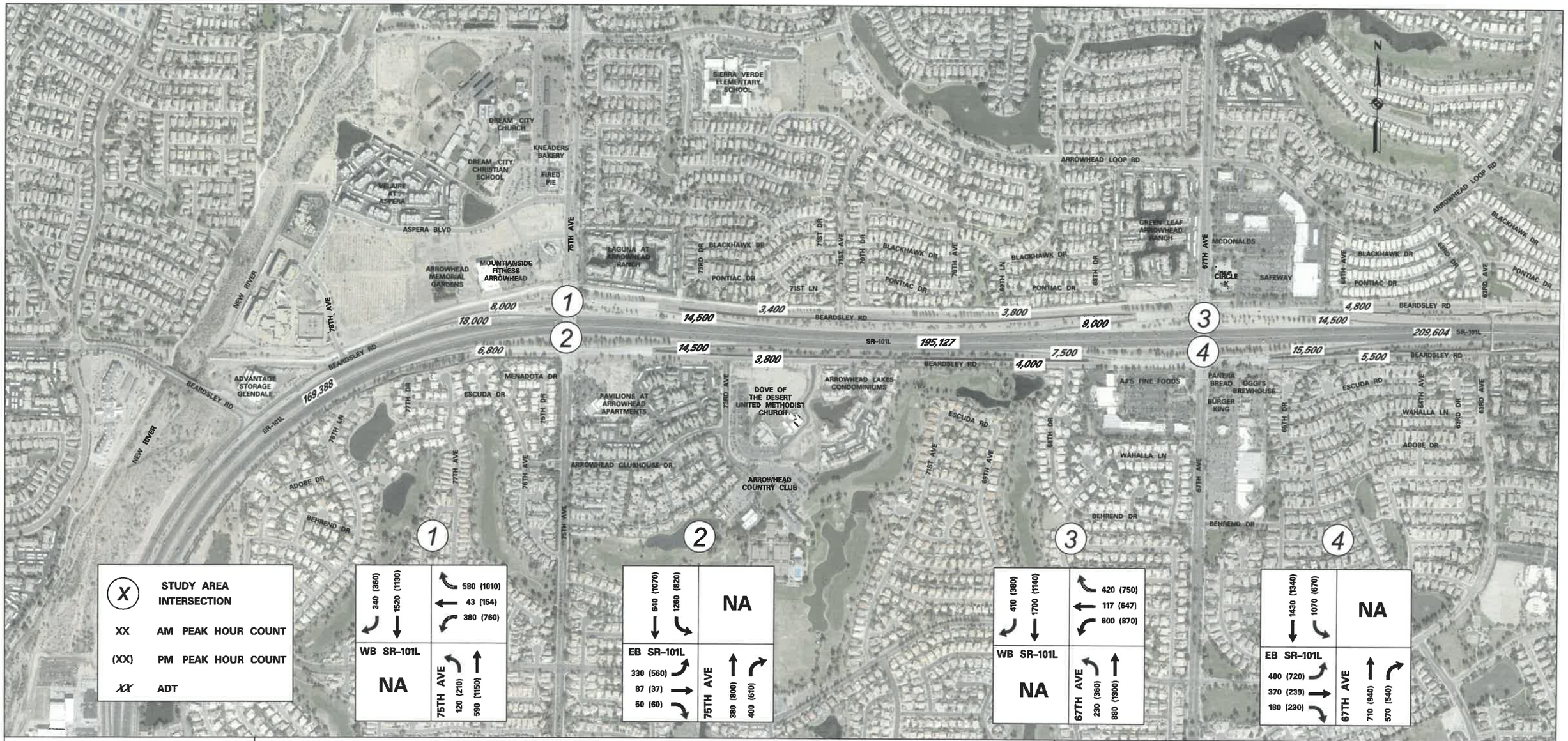
Appendix D



B&N
burgessniple.com

SR-101L/75TH AVENUE TI FEASIBILITY STUDY
EXISTING TURNING MOVEMENT COUNTS

MARICOPA ASSOCIATION of GOVERNMENTS



B&N
burgessniple.com

SR-101L/75TH AVENUE TI FEASIBILITY STUDY
FUTURE TURNING MOVEMENT COUNTS

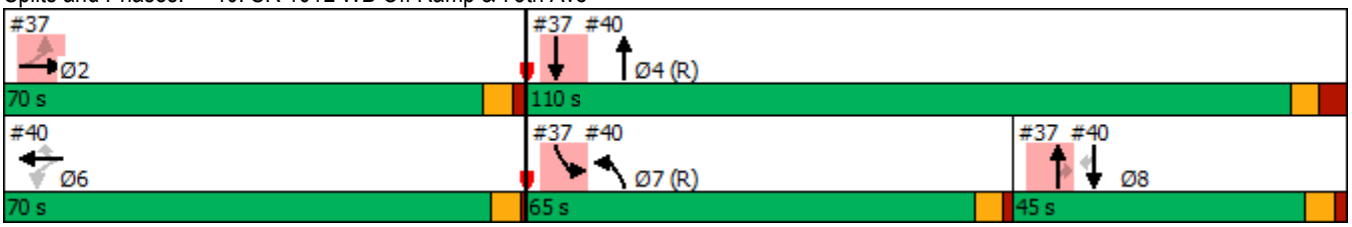
MARICOPA ASSOCIATION of GOVERNMENTS

Appendix E

Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	271	31	486	90	518	1276	297	
Future Volume (vph)	271	31	486	90	518	1276	297	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	28.6	28.6	28.6	31.6	28.6	29.8	29.8	26.3
Total Split (s)	70.0	70.0	70.0	65.0	110.0	45.0	45.0	70.0
Total Split (%)	38.9%	38.9%	38.9%	36.1%	61.1%	25.0%	25.0%	39%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.9	4.9	4.9	5.2	7.8	5.9	5.9	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	65.1	65.1	65.1	59.8	102.2	39.1	39.1	
Actuated g/C Ratio	0.36	0.36	0.36	0.33	0.57	0.22	0.22	
v/c Ratio	0.35	0.32	0.38	0.17	0.28	1.00	0.62	
Control Delay	44.3	13.2	5.5	78.7	28.2	92.7	24.5	
Queue Delay	3.8	1.0	0.0	0.0	0.8	37.5	0.0	
Total Delay	48.1	14.2	5.5	78.7	29.0	130.2	24.5	
LOS	D	B	A	E	C	F	C	
Approach Delay		19.7			36.4	110.2		
Approach LOS		B			D	F		

Intersection Summary	
Cycle Length: 180	
Actuated Cycle Length: 180	
Offset: 29.1 (16%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 71.1	Intersection LOS: E
Intersection Capacity Utilization 68.9%	ICU Level of Service C
Analysis Period (min) 15	

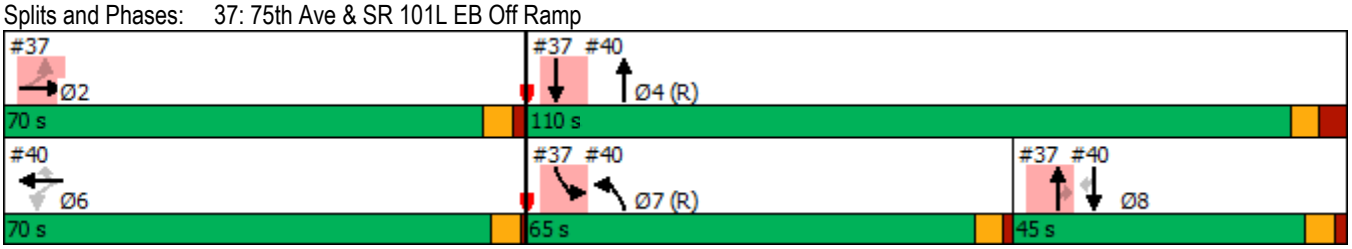
Splits and Phases: 40: SR 101L WB Off Ramp & 75th Ave



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	289	62	319	281	1047	500	
Future Volume (vph)	289	62	319	281	1047	500	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	26.3	26.3	29.8	29.8	31.6	28.6	28.6
Total Split (s)	70.0	70.0	45.0	45.0	65.0	110.0	70.0
Total Split (%)	38.9%	38.9%	25.0%	25.0%	36.1%	61.1%	39%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.2	7.8	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	None
Act Effct Green (s)	64.1	64.1	39.1	39.1	59.8	102.2	
Actuated g/C Ratio	0.36	0.36	0.22	0.22	0.33	0.57	
v/c Ratio	0.27	0.23	0.31	0.52	1.00	0.27	
Control Delay	43.0	39.5	60.1	8.8	122.4	24.5	
Queue Delay	0.0	0.0	0.0	0.0	40.2	1.0	
Total Delay	43.0	39.5	60.1	8.8	162.5	25.5	
LOS	D	D	E	A	F	C	
Approach Delay		40.8	36.1			118.3	
Approach LOS		D	D			F	

Intersection Summary	
Cycle Length: 180	
Actuated Cycle Length: 180	
Offset: 29.1 (16%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 87.0	Intersection LOS: F
Intersection Capacity Utilization 68.9%	ICU Level of Service C
Analysis Period (min) 15	

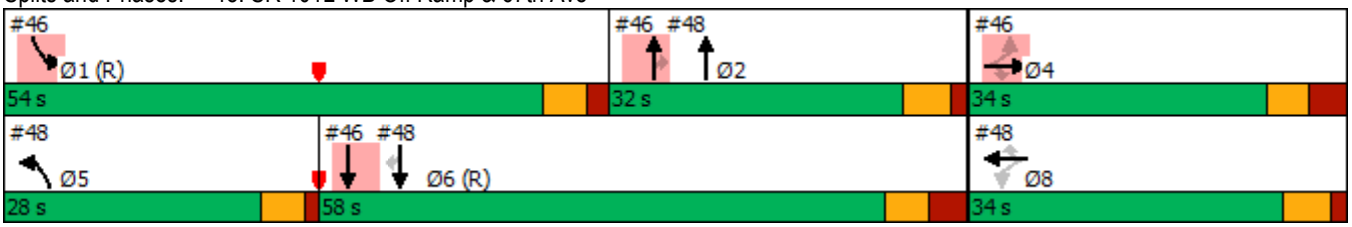
Splits and Phases: 37: 75th Ave & SR 101L EB Off Ramp



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø1	Ø4
Lane Configurations									
Traffic Volume (vph)	522	129	382	157	798	1506	387		
Future Volume (vph)	522	129	382	157	798	1506	387		
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm		
Protected Phases		8		5	2	6		1	4
Permitted Phases	8		8				6		
Detector Phase	8	8	8	5	2	6	6		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	5.0	6.0	6.0	6.0	10.0	8.0
Minimum Split (s)	31.9	31.9	31.9	28.0	27.9	25.4	25.4	29.9	25.4
Total Split (s)	34.0	34.0	34.0	28.0	32.0	58.0	58.0	54.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	23.3%	26.7%	48.3%	48.3%	45%	28%
Yellow Time (s)	4.3	4.3	4.3	3.9	4.3	3.9	3.9	3.9	3.9
All-Red Time (s)	1.6	1.6	1.6	1.2	1.6	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.9	5.9	5.9	5.1	5.9	7.4	7.4		
Lead/Lag				Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	Max	Max	C-Max	C-Max	C-Max	Max
Act Effct Green (s)	28.1	28.1	28.1	22.9	26.1	50.6	50.6		
Actuated g/C Ratio	0.23	0.23	0.23	0.19	0.22	0.42	0.42		
v/c Ratio	0.77	0.78	0.49	0.51	1.13	0.61	0.46		
Control Delay	57.6	49.2	7.8	45.5	105.5	28.1	3.9		
Queue Delay	4.2	2.8	0.0	0.0	0.0	0.0	0.0		
Total Delay	61.8	52.0	7.8	45.5	105.5	28.2	3.9		
LOS	E	D	A	D	F	C	A		
Approach Delay		44.2			95.6	23.2			
Approach LOS		D			F	C			

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 107 (89%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.13	
Intersection Signal Delay: 46.6	Intersection LOS: D
Intersection Capacity Utilization 78.8%	ICU Level of Service D
Analysis Period (min) 15	

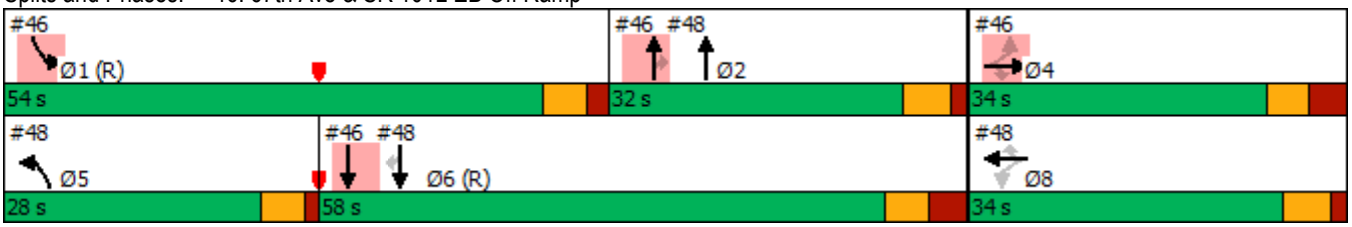
Splits and Phases: 48: SR 101L WB Off Ramp & 67th Ave



Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	Ø5	Ø8
Lane Configurations									
Traffic Volume (vph)	376	265	123	579	364	953	1075		
Future Volume (vph)	376	265	123	579	364	953	1075		
Turn Type	Perm	NA	Perm	NA	Perm	Prot	NA		
Protected Phases		4		2		1	6	5	8
Permitted Phases	4		4		2				
Detector Phase	4	4	4	2	2	1	6		
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	6.0	6.0	10.0	6.0	5.0	10.0
Minimum Split (s)	25.4	25.4	25.4	27.9	27.9	29.9	25.4	28.0	31.9
Total Split (s)	34.0	34.0	34.0	32.0	32.0	54.0	58.0	28.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	26.7%	26.7%	45.0%	48.3%	23%	28%
Yellow Time (s)	3.9	3.9	3.9	4.3	4.3	3.9	3.9	3.9	4.3
All-Red Time (s)	3.5	3.5	3.5	1.6	1.6	2.0	3.5	1.2	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	7.4	7.4	7.4	5.9	5.9	5.9	7.4		
Lead/Lag				Lag	Lag	Lead	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max	Max	Max	Max	C-Max	C-Max	Max	None
Act Effct Green (s)	26.6	26.6	26.6	26.1	26.1	48.1	50.6		
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22	0.40	0.42		
v/c Ratio	0.65	0.69	0.28	0.57	0.87	0.75	0.78		
Control Delay	52.4	48.5	6.1	44.3	50.1	45.4	21.1		
Queue Delay	0.0	0.0	0.0	1.0	0.0	11.8	0.1		
Total Delay	52.4	48.5	6.1	45.3	50.1	57.2	21.2		
LOS	D	D	A	D	D	E	C		
Approach Delay		43.4		47.1			38.1		
Approach LOS		D		D			D		

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 107 (89%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.13	
Intersection Signal Delay: 41.5	Intersection LOS: D
Intersection Capacity Utilization 78.8%	ICU Level of Service D
Analysis Period (min) 15	

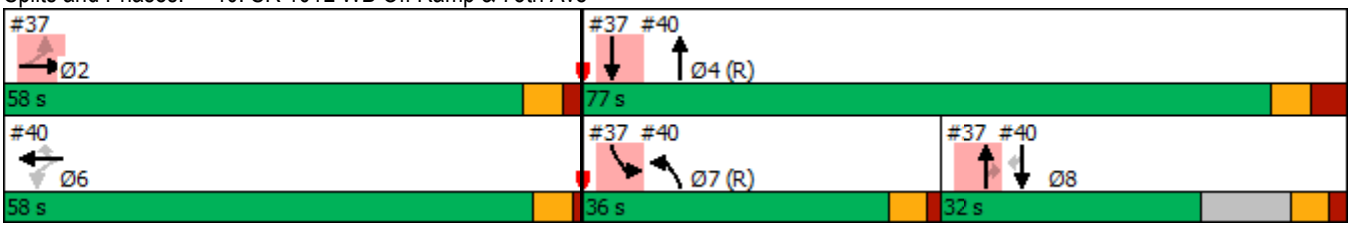
Splits and Phases: 46: 67th Ave & SR 101L EB Off Ramp



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	555	112	859	155	1004	984	311	
Future Volume (vph)	555	112	859	155	1004	984	311	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	23.7	23.7	23.7	31.2	25.8	27.9	27.9	25.9
Total Split (s)	58.0	58.0	58.0	36.0	77.0	32.0	32.0	58.0
Total Split (%)	43.0%	43.0%	43.0%	26.7%	57.0%	23.7%	23.7%	43%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.9	4.9	4.9	5.2	7.8	5.9	5.9	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	Max	Max	Max	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	53.1	53.1	53.1	30.8	69.2	35.1	35.1	
Actuated g/C Ratio	0.39	0.39	0.39	0.23	0.51	0.26	0.26	
v/c Ratio	0.66	0.66	0.76	0.42	0.60	0.64	0.51	
Control Delay	39.5	33.9	38.3	70.1	25.6	46.5	6.9	
Queue Delay	10.4	6.4	0.0	0.0	1.5	0.0	0.0	
Total Delay	49.9	40.2	38.3	70.1	27.1	46.5	6.9	
LOS	D	D	D	E	C	D	A	
Approach Delay		42.1			32.8	37.0		
Approach LOS		D			C	D		

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Offset: 62 (46%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 37.7	Intersection LOS: D
Intersection Capacity Utilization 73.8%	ICU Level of Service D
Analysis Period (min) 15	

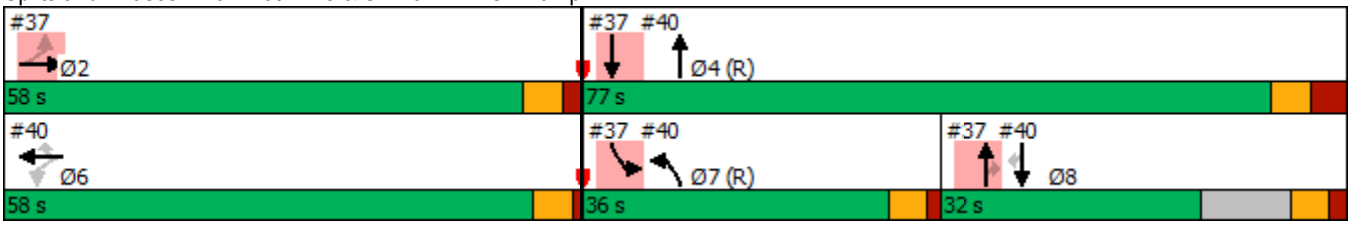
Splits and Phases: 40: SR 101L WB Off Ramp & 75th Ave



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	478	26	681	435	697	842	
Future Volume (vph)	478	26	681	435	697	842	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	25.9	25.9	27.9	27.9	31.2	25.8	23.7
Total Split (s)	58.0	58.0	32.0	32.0	36.0	77.0	58.0
Total Split (%)	43.0%	43.0%	23.7%	23.7%	26.7%	57.0%	43%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.2	7.8	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	Max
Act Effct Green (s)	52.1	52.1	35.1	35.1	30.8	69.2	
Actuated g/C Ratio	0.39	0.39	0.26	0.26	0.23	0.51	
v/c Ratio	0.42	0.27	0.56	0.66	0.97	0.50	
Control Delay	33.0	27.9	45.2	11.5	94.8	18.0	
Queue Delay	0.0	0.0	0.0	0.0	37.7	0.6	
Total Delay	33.0	27.9	45.2	11.5	132.5	18.6	
LOS	C	C	D	B	F	B	
Approach Delay		30.1	32.1			70.2	
Approach LOS		C	C			E	

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Offset: 62 (46%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 50.1	Intersection LOS: D
Intersection Capacity Utilization 73.8%	ICU Level of Service D
Analysis Period (min) 15	

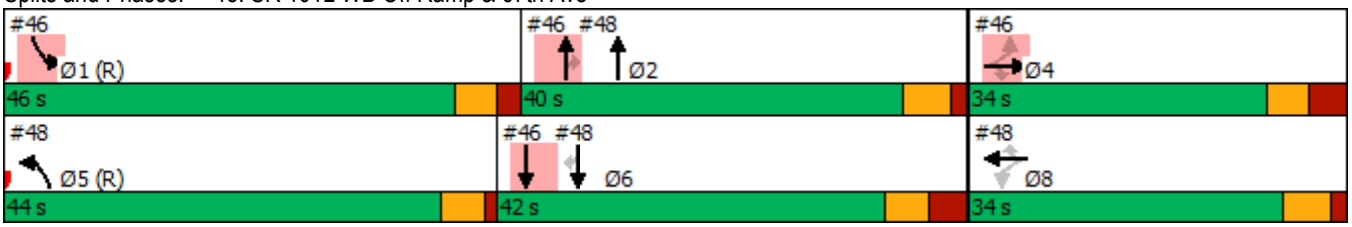
Splits and Phases: 37: 75th Ave & SR 101L EB Off Ramp



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø1	Ø4
Lane Configurations									
Traffic Volume (vph)	587	473	690	245	1168	1035	352		
Future Volume (vph)	587	473	690	245	1168	1035	352		
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm		
Protected Phases		8		5	2	6		1	4
Permitted Phases	8		8				6		
Detector Phase	8	8	8	5	2	6	6		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	5.0	6.0	6.0	6.0	10.0	8.0
Minimum Split (s)	32.3	32.3	32.3	32.0	28.0	23.9	23.9	29.9	24.4
Total Split (s)	34.0	34.0	34.0	44.0	40.0	42.0	42.0	46.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	36.7%	33.3%	35.0%	35.0%	38%	28%
Yellow Time (s)	4.3	4.3	4.3	3.9	4.3	3.9	3.9	3.9	3.9
All-Red Time (s)	1.6	1.6	1.6	1.2	1.6	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.9	5.9	5.9	5.1	5.9	7.4	7.4		
Lead/Lag				Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	C-Max	Max	Max	Max	C-Max	Max
Act Effct Green (s)	28.1	28.1	28.1	38.9	34.1	34.6	34.6		
Actuated g/C Ratio	0.23	0.23	0.23	0.32	0.28	0.29	0.29		
v/c Ratio	1.30	1.30	0.65	0.46	1.26	0.61	0.61		
Control Delay	192.0	181.9	8.7	45.9	158.4	38.5	17.0		
Queue Delay	0.4	0.2	0.0	2.1	0.0	0.3	0.0		
Total Delay	192.4	182.1	8.7	48.0	158.4	38.8	17.0		
LOS	F	F	A	D	F	D	B		
Approach Delay		144.5			139.2	33.3			
Approach LOS		F			F	C			

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 57 (48%), Referenced to phase 1:SBL and 5:, Start of Green	
Natural Cycle: 125	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.30	
Intersection Signal Delay: 108.9	Intersection LOS: F
Intersection Capacity Utilization 95.6%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 48: SR 101L WB Off Ramp & 67th Ave

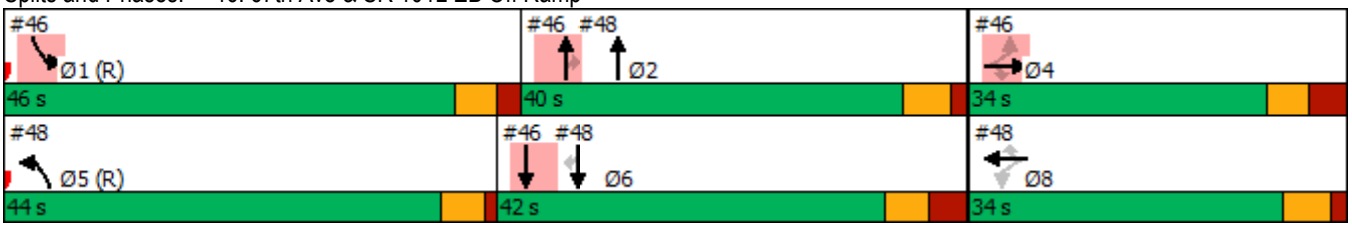


Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	Ø5	Ø8
Lane Configurations									
Traffic Volume (vph)	660	173	158	753	358	615	1007		
Future Volume (vph)	660	173	158	753	358	615	1007		
Turn Type	Perm	NA	Perm	NA	Perm	Prot	NA		
Protected Phases		4		2		1	6	5	8
Permitted Phases	4		4		2				
Detector Phase	4	4	4	2	2	1	6		
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	6.0	6.0	10.0	6.0	5.0	10.0
Minimum Split (s)	24.4	24.4	24.4	28.0	28.0	29.9	23.9	32.0	32.3
Total Split (s)	34.0	34.0	34.0	40.0	40.0	46.0	42.0	44.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	33.3%	33.3%	38.3%	35.0%	37%	28%
Yellow Time (s)	3.9	3.9	3.9	4.3	4.3	3.9	3.9	3.9	4.3
All-Red Time (s)	3.5	3.5	3.5	1.6	1.6	2.0	3.5	1.2	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	7.4	7.4	7.4	5.9	5.9	5.9	7.4		
Lead/Lag				Lag	Lag	Lead	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max	Max	Max	Max	C-Max	Max	C-Max	None
Act Effct Green (s)	26.6	26.6	26.6	34.1	34.1	40.1	34.6		
Actuated g/C Ratio	0.22	0.22	0.22	0.28	0.28	0.33	0.29		
v/c Ratio	1.01	1.00dl	0.35	0.57	0.66	0.58	1.07		
Control Delay	96.1	55.4	8.3	38.5	24.6	51.8	72.7		
Queue Delay	0.0	0.0	0.0	1.4	0.0	3.2	0.0		
Total Delay	96.1	55.4	8.3	39.8	24.6	55.0	72.7		
LOS	F	E	A	D	C	E	E		
Approach Delay		62.2		34.9			66.0		
Approach LOS		E		C			E		

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 57 (48%), Referenced to phase 1:SBL and 5:, Start of Green	
Natural Cycle: 125	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.30	
Intersection Signal Delay: 55.7	Intersection LOS: E
Intersection Capacity Utilization 95.6%	ICU Level of Service F
Analysis Period (min) 15	

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

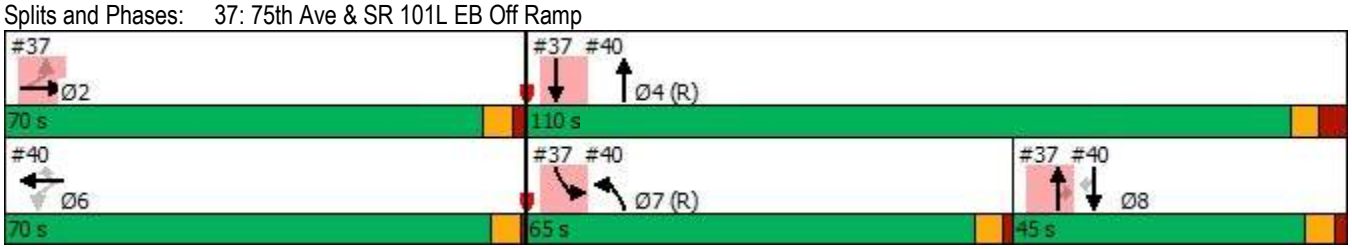
Splits and Phases: 46: 67th Ave & SR 101L EB Off Ramp



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	330	87	380	400	1260	640	
Future Volume (vph)	330	87	380	400	1260	640	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	26.3	26.3	29.8	29.8	31.6	28.6	28.6
Total Split (s)	70.0	70.0	45.0	45.0	65.0	110.0	70.0
Total Split (%)	38.9%	38.9%	25.0%	25.0%	36.1%	61.1%	39%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.2	7.8	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	None
Act Effct Green (s)	64.1	64.1	39.1	39.1	59.8	102.2	
Actuated g/C Ratio	0.36	0.36	0.22	0.22	0.33	0.57	
v/c Ratio	0.31	0.29	0.37	0.66	1.20	0.35	
Control Delay	43.9	40.6	61.2	12.6	173.8	27.5	
Queue Delay	0.0	0.0	0.0	0.0	4.6	2.3	
Total Delay	43.9	40.6	61.2	12.6	178.4	29.8	
LOS	D	D	E	B	F	C	
Approach Delay		41.8	36.3			128.3	
Approach LOS		D	D			F	

Intersection Summary	
Cycle Length: 180	
Actuated Cycle Length: 180	
Offset: 29.1 (16%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.20	
Intersection Signal Delay: 92.7	Intersection LOS: F
Intersection Capacity Utilization 83.9%	ICU Level of Service E
Analysis Period (min) 15	

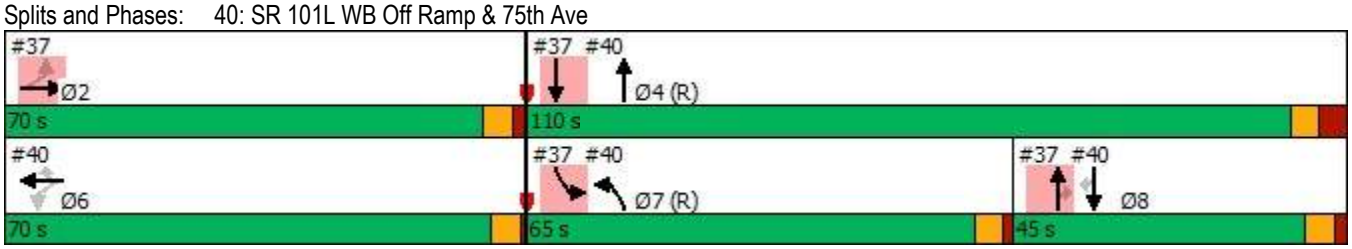
Splits and Phases: 37: 75th Ave & SR 101L EB Off Ramp



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	380	43	580	120	590	1520	340	
Future Volume (vph)	380	43	580	120	590	1520	340	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	28.6	28.6	28.6	31.6	28.6	29.8	29.8	26.3
Total Split (s)	70.0	70.0	70.0	65.0	110.0	45.0	45.0	70.0
Total Split (%)	38.9%	38.9%	38.9%	36.1%	61.1%	25.0%	25.0%	39%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.9	4.9	4.9	5.2	7.8	5.9	5.9	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	65.1	65.1	65.1	59.8	102.2	39.1	39.1	
Actuated g/C Ratio	0.36	0.36	0.36	0.33	0.57	0.22	0.22	
v/c Ratio	0.46	0.42	0.46	0.22	0.32	1.19	0.72	
Control Delay	47.2	21.9	11.5	80.3	28.0	149.9	35.1	
Queue Delay	14.4	2.7	0.0	0.0	0.8	1.4	0.0	
Total Delay	61.6	24.6	11.5	80.3	28.8	151.2	35.1	
LOS	E	C	B	F	C	F	D	
Approach Delay		29.9			37.5	130.0		
Approach LOS		C			D	F		

Intersection Summary	
Cycle Length: 180	
Actuated Cycle Length: 180	
Offset: 29.1 (16%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.20	
Intersection Signal Delay: 83.5	Intersection LOS: F
Intersection Capacity Utilization 83.9%	ICU Level of Service E
Analysis Period (min) 15	

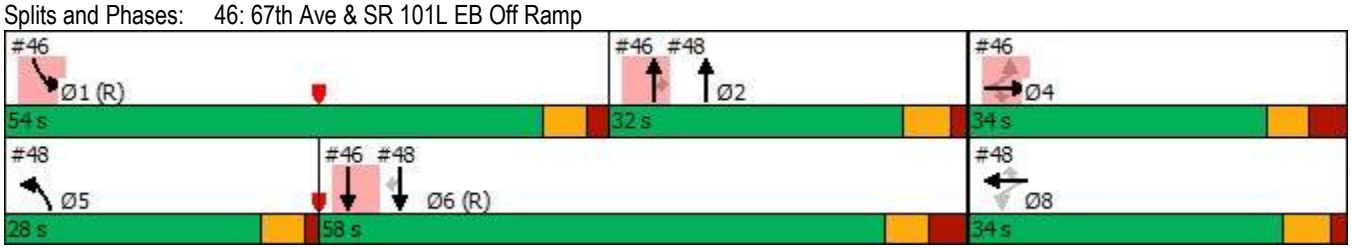
Splits and Phases: 40: SR 101L WB Off Ramp & 75th Ave



Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	Ø5	Ø8
Lane Configurations									
Traffic Volume (vph)	400	370	180	710	570	1070	1430		
Future Volume (vph)	400	370	180	710	570	1070	1430		
Turn Type	Perm	NA	Perm	NA	Perm	Prot	NA		
Protected Phases		4		2		1	6	5	8
Permitted Phases	4		4		2				
Detector Phase	4	4	4	2	2	1	6		
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	6.0	6.0	10.0	6.0	5.0	10.0
Minimum Split (s)	25.4	25.4	25.4	27.9	27.9	29.9	25.4	28.0	31.9
Total Split (s)	34.0	34.0	34.0	32.0	32.0	54.0	58.0	28.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	26.7%	26.7%	45.0%	48.3%	23%	28%
Yellow Time (s)	3.9	3.9	3.9	4.3	4.3	3.9	3.9	3.9	4.3
All-Red Time (s)	3.5	3.5	3.5	1.6	1.6	2.0	3.5	1.2	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	7.4	7.4	7.4	5.9	5.9	5.9	7.4		
Lead/Lag				Lag	Lag	Lead	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max	Max	Max	Max	C-Max	C-Max	Max	None
Act Effct Green (s)	26.6	26.6	26.6	26.1	26.1	48.1	50.6		
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22	0.40	0.42		
v/c Ratio	0.78	0.83	0.39	0.70	1.37	0.85	1.04		
Control Delay	60.4	55.8	8.2	47.2	208.6	47.8	55.0		
Queue Delay	0.0	0.0	0.0	5.4	0.0	48.1	0.0		
Total Delay	60.4	55.8	8.2	52.7	208.6	95.9	55.0		
LOS	E	E	A	D	F	F	E		
Approach Delay		48.9		122.1			72.5		
Approach LOS		D		F			E		

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 107 (89%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.37	
Intersection Signal Delay: 81.2	Intersection LOS: F
Intersection Capacity Utilization 104.3%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 46: 67th Ave & SR 101L EB Off Ramp

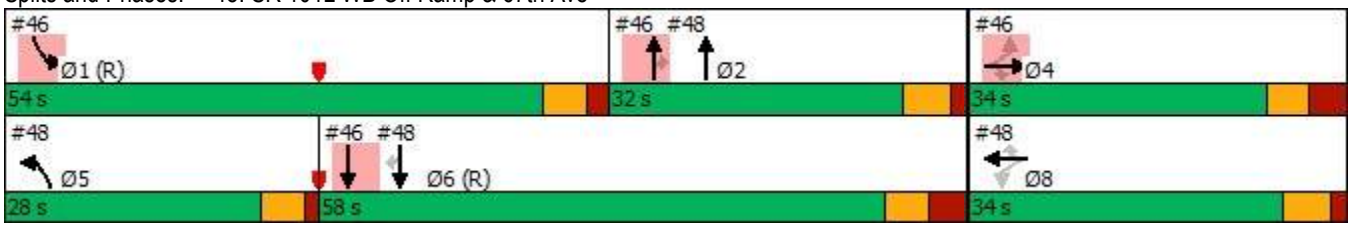


Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø1	Ø4
Lane Configurations									
Traffic Volume (vph)	800	177	420	230	880	1700	410		
Future Volume (vph)	800	177	420	230	880	1700	410		
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm		
Protected Phases		8		5	2	6		1	4
Permitted Phases	8		8				6		
Detector Phase	8	8	8	5	2	6	6		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	5.0	6.0	6.0	6.0	10.0	8.0
Minimum Split (s)	31.9	31.9	31.9	28.0	27.9	25.4	25.4	29.9	25.4
Total Split (s)	34.0	34.0	34.0	28.0	32.0	58.0	58.0	54.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	23.3%	26.7%	48.3%	48.3%	45%	28%
Yellow Time (s)	4.3	4.3	4.3	3.9	4.3	3.9	3.9	3.9	3.9
All-Red Time (s)	1.6	1.6	1.6	1.2	1.6	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.9	5.9	5.9	5.1	5.9	7.4	7.4		
Lead/Lag				Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	Max	Max	C-Max	C-Max	C-Max	Max
Act Effct Green (s)	28.1	28.1	28.1	22.9	26.1	50.6	50.6		
Actuated g/C Ratio	0.23	0.23	0.23	0.19	0.22	0.42	0.42		
v/c Ratio	1.15	1.12dl	0.57	0.74	1.24	0.68	0.53		
Control Delay	136.8	86.1	8.1	53.2	150.4	29.8	10.8		
Queue Delay	3.5	27.2	0.0	0.0	0.0	0.3	0.0		
Total Delay	140.4	113.3	8.1	53.2	150.4	30.1	10.8		
LOS	F	F	A	D	F	C	B		
Approach Delay		97.6			130.3	26.4			
Approach LOS		F			F	C			

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 107 (89%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.37	
Intersection Signal Delay: 72.9	Intersection LOS: E
Intersection Capacity Utilization 104.3%	ICU Level of Service G
Analysis Period (min) 15	

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

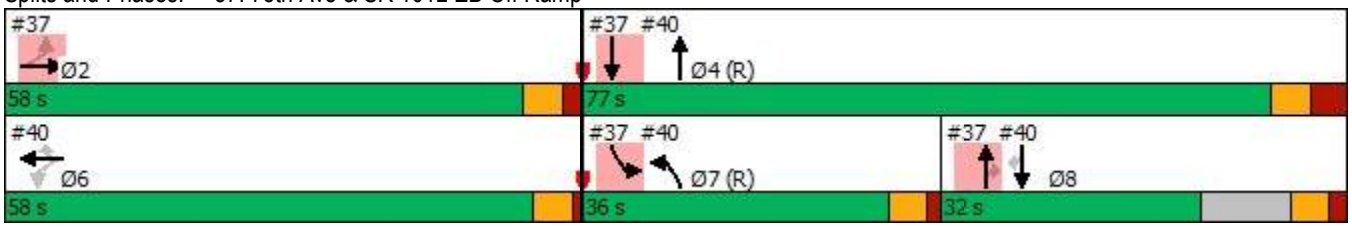
Splits and Phases: 48: SR 101L WB Off Ramp & 67th Ave



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	560	37	800	610	820	1070	
Future Volume (vph)	560	37	800	610	820	1070	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	25.9	25.9	27.9	27.9	31.2	25.8	23.7
Total Split (s)	58.0	58.0	32.0	32.0	36.0	77.0	58.0
Total Split (%)	43.0%	43.0%	23.7%	23.7%	26.7%	57.0%	43%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.2	7.8	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	Max
Act Effct Green (s)	52.1	52.1	35.1	35.1	30.8	69.2	
Actuated g/C Ratio	0.39	0.39	0.26	0.26	0.23	0.51	
v/c Ratio	0.49	0.33	0.66	0.85	1.14	0.64	
Control Delay	34.7	28.7	47.4	23.6	132.8	22.4	
Queue Delay	0.4	0.1	0.0	0.0	0.7	2.4	
Total Delay	35.1	28.8	47.4	23.6	133.6	24.8	
LOS	D	C	D	C	F	C	
Approach Delay		31.5	37.1			72.0	
Approach LOS		C	D			E	

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Offset: 62 (46%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.14	
Intersection Signal Delay: 52.8	Intersection LOS: D
Intersection Capacity Utilization 117.6%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 37: 75th Ave & SR 101L EB Off Ramp

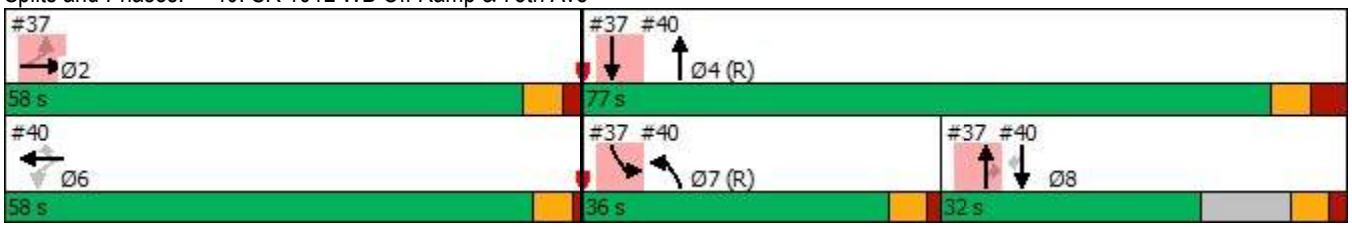


Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	760	154	1010	210	1150	1130	360	
Future Volume (vph)	760	154	1010	210	1150	1130	360	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	23.7	23.7	23.7	31.2	25.8	27.9	27.9	25.9
Total Split (s)	58.0	58.0	58.0	36.0	77.0	32.0	32.0	58.0
Total Split (%)	43.0%	43.0%	43.0%	26.7%	57.0%	23.7%	23.7%	43%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.9	4.9	4.9	5.2	7.8	5.9	5.9	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	Max	Max	Max	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	53.1	53.1	53.1	30.8	69.2	35.1	35.1	
Actuated g/C Ratio	0.39	0.39	0.39	0.23	0.51	0.26	0.26	
v/c Ratio	0.85	0.93dr	0.89	0.57	0.69	0.74	0.56	
Control Delay	51.4	45.0	50.9	73.2	29.7	48.9	7.1	
Queue Delay	52.1	49.1	0.0	1.2	5.5	0.0	0.0	
Total Delay	103.5	94.0	50.9	74.5	35.2	48.9	7.1	
LOS	F	F	D	E	D	D	A	
Approach Delay		85.2			41.2	38.8		
Approach LOS		F			D	D		

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Offset: 62 (46%), Referenced to phase 4:SBT and 7:SBL, Start of Green	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.14	
Intersection Signal Delay: 58.2	Intersection LOS: E
Intersection Capacity Utilization 117.6%	ICU Level of Service H
Analysis Period (min) 15	

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 40: SR 101L WB Off Ramp & 75th Ave

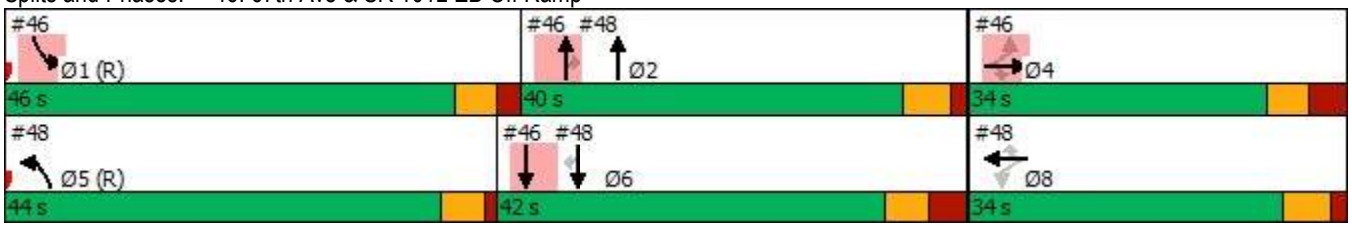


Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	Ø5	Ø8
Lane Configurations									
Traffic Volume (vph)	720	239	230	940	540	670	1340		
Future Volume (vph)	720	239	230	940	540	670	1340		
Turn Type	Perm	NA	Perm	NA	Perm	Prot	NA		
Protected Phases		4		2		1	6	5	8
Permitted Phases	4		4		2				
Detector Phase	4	4	4	2	2	1	6		
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	6.0	6.0	10.0	6.0	5.0	10.0
Minimum Split (s)	24.4	24.4	24.4	28.0	28.0	29.9	23.9	32.0	32.3
Total Split (s)	34.0	34.0	34.0	40.0	40.0	46.0	42.0	44.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	33.3%	33.3%	38.3%	35.0%	37%	28%
Yellow Time (s)	3.9	3.9	3.9	4.3	4.3	3.9	3.9	3.9	4.3
All-Red Time (s)	3.5	3.5	3.5	1.6	1.6	2.0	3.5	1.2	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	7.4	7.4	7.4	5.9	5.9	5.9	7.4		
Lead/Lag				Lag	Lag	Lead	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max	Max	Max	Max	C-Max	Max	C-Max	None
Act Effct Green (s)	26.6	26.6	26.6	34.1	34.1	40.1	34.6		
Actuated g/C Ratio	0.22	0.22	0.22	0.28	0.28	0.33	0.29		
v/c Ratio	1.10	1.09dl	0.46	0.71	1.08	0.63	1.43		
Control Delay	120.6	77.2	8.2	41.7	94.6	48.4	222.6		
Queue Delay	1.4	21.5	0.0	12.5	0.0	6.8	0.0		
Total Delay	122.0	98.7	8.2	54.2	94.6	55.2	222.6		
LOS	F	F	A	D	F	E	F		
Approach Delay		90.0		69.0			166.8		
Approach LOS		F		E			F		

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 57 (48%), Referenced to phase 1:SBL and 5:, Start of Green	
Natural Cycle: 145	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.73	
Intersection Signal Delay: 116.3	Intersection LOS: F
Intersection Capacity Utilization 117.1%	ICU Level of Service H
Analysis Period (min) 15	

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

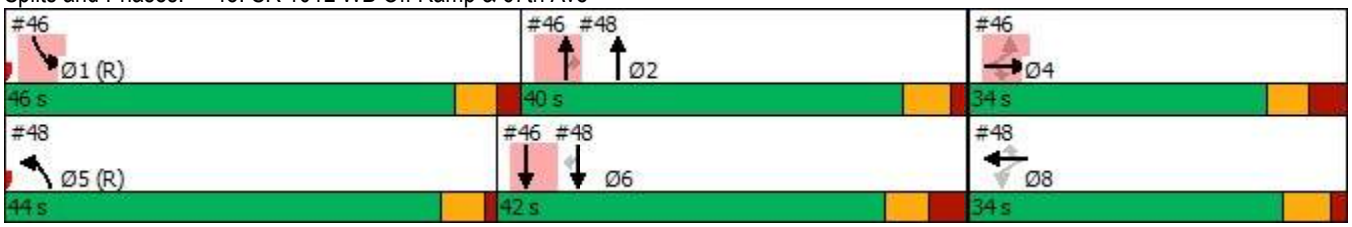
Splits and Phases: 46: 67th Ave & SR 101L EB Off Ramp



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø1	Ø4
Lane Configurations									
Traffic Volume (vph)	870	647	750	360	1300	1140	380		
Future Volume (vph)	870	647	750	360	1300	1140	380		
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm		
Protected Phases		8		5	2	6		1	4
Permitted Phases	8		8				6		
Detector Phase	8	8	8	5	2	6	6		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	5.0	6.0	6.0	6.0	10.0	8.0
Minimum Split (s)	32.3	32.3	32.3	32.0	28.0	23.9	23.9	29.9	24.4
Total Split (s)	34.0	34.0	34.0	44.0	40.0	42.0	42.0	46.0	34.0
Total Split (%)	28.3%	28.3%	28.3%	36.7%	33.3%	35.0%	35.0%	38%	28%
Yellow Time (s)	4.3	4.3	4.3	3.9	4.3	3.9	3.9	3.9	3.9
All-Red Time (s)	1.6	1.6	1.6	1.2	1.6	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.9	5.9	5.9	5.1	5.9	7.4	7.4		
Lead/Lag				Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	C-Max	Max	Max	Max	C-Max	Max
Act Effct Green (s)	28.1	28.1	28.1	38.9	34.1	34.6	34.6		
Actuated g/C Ratio	0.23	0.23	0.23	0.32	0.28	0.29	0.29		
v/c Ratio	1.68	1.73	0.73	0.68	1.41	0.67	0.74		
Control Delay	348.8	362.7	9.6	51.5	216.4	39.8	34.3		
Queue Delay	0.6	0.4	0.0	24.2	0.0	1.6	0.0		
Total Delay	349.4	363.1	9.6	75.7	216.4	41.4	34.3		
LOS	F	F	A	E	F	D	C		
Approach Delay		278.9			185.9	39.6			
Approach LOS		F			F	D			

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 57 (48%), Referenced to phase 1:SBL and 5:, Start of Green	
Natural Cycle: 145	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.73	
Intersection Signal Delay: 183.8	Intersection LOS: F
Intersection Capacity Utilization 117.1%	ICU Level of Service H
Analysis Period (min) 15	

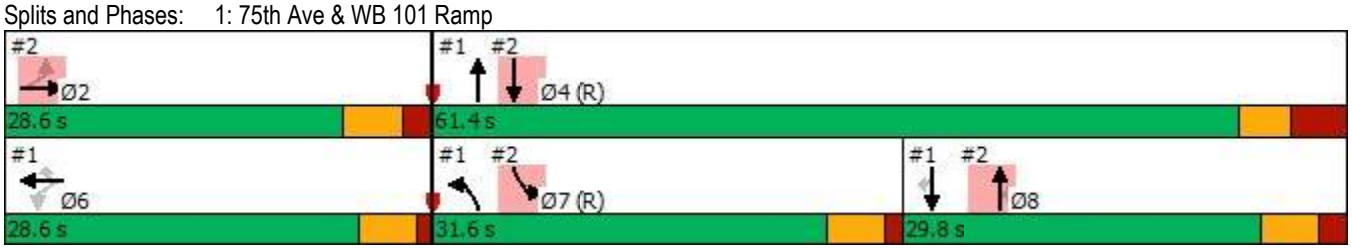
Splits and Phases: 48: SR 101L WB Off Ramp & 67th Ave



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	380	43	580	120	590	1520	340	
Future Volume (vph)	380	43	580	120	590	1520	340	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	28.6	28.6	28.6	31.6	28.6	29.8	29.8	26.3
Total Split (s)	28.6	28.6	28.6	31.6	61.4	29.8	29.8	28.6
Total Split (%)	31.8%	31.8%	31.8%	35.1%	68.2%	33.1%	33.1%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.5	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	-0.9	-0.9	-0.9	-1.2	-3.4	-1.9	-1.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	24.6	24.6	24.6	27.6	57.4	25.8	25.8	
Actuated g/C Ratio	0.27	0.27	0.27	0.31	0.64	0.29	0.29	
v/c Ratio	0.61	0.51	0.52	0.24	0.28	0.76	0.52	
Control Delay	35.4	13.0	7.6	50.7	12.6	32.1	5.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.2	0.0	
Total Delay	35.4	13.0	7.6	50.7	12.6	32.3	5.7	
LOS	D	B	A	D	B	C	A	
Approach Delay		16.9			19.0	27.5		
Approach LOS		B			B	C		

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 22.8	Intersection LOS: C
Intersection Capacity Utilization 67.8%	ICU Level of Service C
Analysis Period (min) 15	

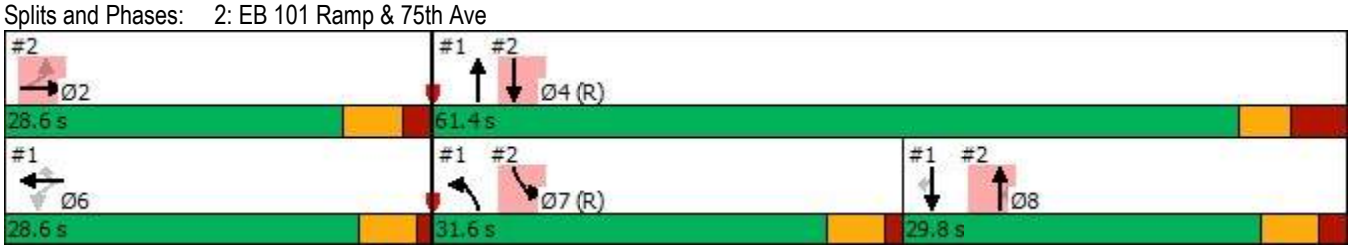
Splits and Phases: 1: 75th Ave & WB 101 Ramp



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	330	87	380	400	1260	640	
Future Volume (vph)	330	87	380	400	1260	640	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	26.3	26.3	29.8	29.8	31.6	28.6	28.6
Total Split (s)	28.6	28.6	29.8	29.8	31.6	61.4	28.6
Total Split (%)	31.8%	31.8%	33.1%	33.1%	35.1%	68.2%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.5	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.2	-3.4	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	None
Act Effct Green (s)	24.6	24.6	25.8	25.8	27.6	57.4	
Actuated g/C Ratio	0.27	0.27	0.29	0.29	0.31	0.64	
v/c Ratio	0.41	0.37	0.28	0.64	0.90	0.31	
Control Delay	30.1	25.9	25.6	12.1	59.3	11.8	
Queue Delay	0.0	0.0	0.0	0.0	2.8	0.4	
Total Delay	30.1	25.9	25.6	12.1	62.2	12.2	
LOS	C	C	C	B	E	B	
Approach Delay		27.4	18.7			45.3	
Approach LOS		C	B			D	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 36.1	Intersection LOS: D
Intersection Capacity Utilization 67.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: EB 101 Ramp & 75th Ave

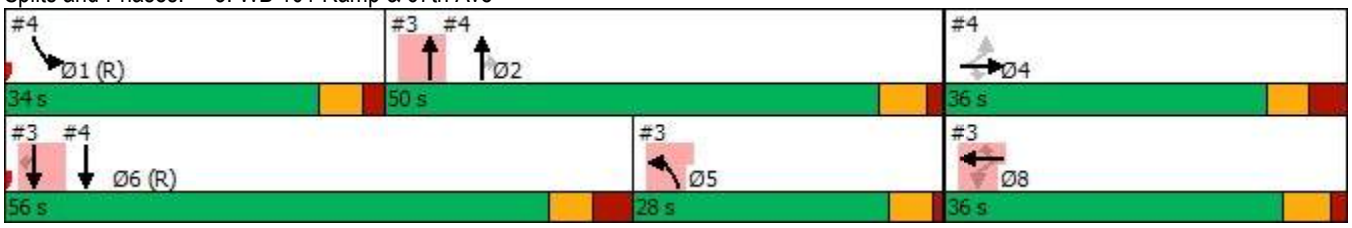


Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø1	Ø4
Lane Configurations									
Traffic Volume (vph)	800	117	420	230	880	1700	410		
Future Volume (vph)	800	117	420	230	880	1700	410		
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm		
Protected Phases		8		5	2	6		1	4
Permitted Phases	8		8				6		
Detector Phase	8	8	8	5	2	6	6		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	5.0	6.0	6.0	6.0	10.0	8.0
Minimum Split (s)	31.9	31.9	31.9	28.0	27.9	25.4	25.4	29.9	25.4
Total Split (s)	36.0	36.0	36.0	28.0	50.0	56.0	56.0	34.0	36.0
Total Split (%)	30.0%	30.0%	30.0%	23.3%	41.7%	46.7%	46.7%	28%	30%
Yellow Time (s)	4.3	4.3	4.3	3.9	4.3	3.9	3.9	3.9	3.9
All-Red Time (s)	1.6	1.6	1.6	1.2	1.6	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.1	-1.9	-3.4	-3.4		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Lead/Lag				Lag	Lag	Lead	Lead	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	Max	Max	C-Max	C-Max	C-Max	Max
Act Effct Green (s)	32.0	32.0	32.0	24.0	46.0	52.0	52.0		
Actuated g/C Ratio	0.27	0.27	0.27	0.20	0.38	0.43	0.43		
v/c Ratio	1.01	0.98dl	0.52	0.71	0.71	0.57	0.48		
Control Delay	91.1	51.8	7.0	29.1	35.9	26.4	4.4		
Queue Delay	29.7	5.1	0.0	0.0	0.6	0.2	0.0		
Total Delay	120.8	56.9	7.0	29.1	36.6	26.5	4.4		
LOS	F	E	A	C	D	C	A		
Approach Delay		65.0			35.0	22.2			
Approach LOS		E			D	C			

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 37.9	Intersection LOS: D
Intersection Capacity Utilization 98.8%	ICU Level of Service F
Analysis Period (min) 15	

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

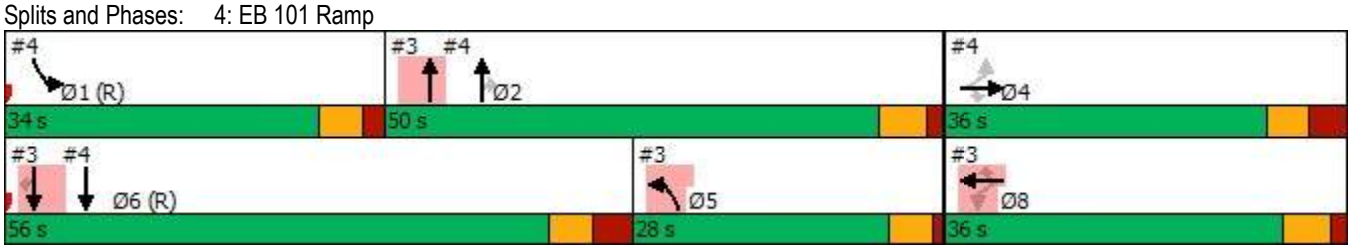
Splits and Phases: 3: WB 101 Ramp & 67th Ave



Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	Ø5	Ø8
Lane Configurations									
Traffic Volume (vph)	400	370	180	710	570	1070	1430		
Future Volume (vph)	400	370	180	710	570	1070	1430		
Turn Type	Perm	NA	Perm	NA	Perm	Prot	NA		
Protected Phases		4		2		1	6	5	8
Permitted Phases	4		4		2				
Detector Phase	4	4	4	2	2	1	6		
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	6.0	6.0	10.0	6.0	5.0	10.0
Minimum Split (s)	25.4	25.4	25.4	27.9	27.9	29.9	25.4	28.0	31.9
Total Split (s)	36.0	36.0	36.0	50.0	50.0	34.0	56.0	28.0	36.0
Total Split (%)	30.0%	30.0%	30.0%	41.7%	41.7%	28.3%	46.7%	23%	30%
Yellow Time (s)	3.9	3.9	3.9	4.3	4.3	3.9	3.9	3.9	4.3
All-Red Time (s)	3.5	3.5	3.5	1.6	1.6	2.0	3.5	1.2	1.6
Lost Time Adjust (s)	-3.4	-3.4	-3.4	-1.9	-1.9	-1.9	-3.4		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Lead/Lag				Lag	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max	Max	Max	Max	C-Max	C-Max	Max	None
Act Effct Green (s)	32.0	32.0	32.0	46.0	46.0	30.0	52.0		
Actuated g/C Ratio	0.27	0.27	0.27	0.38	0.38	0.25	0.43		
v/c Ratio	0.65	0.69	0.34	0.40	0.93	0.93	1.01		
Control Delay	47.2	44.3	6.9	27.7	52.8	34.7	48.6		
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.2	32.8		
Total Delay	47.2	44.3	6.9	27.7	52.8	34.9	81.4		
LOS	D	D	A	C	D	C	F		
Approach Delay		38.7		38.9			61.5		
Approach LOS		D		D			E		

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 50.8	Intersection LOS: D
Intersection Capacity Utilization 98.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 4: EB 101 Ramp

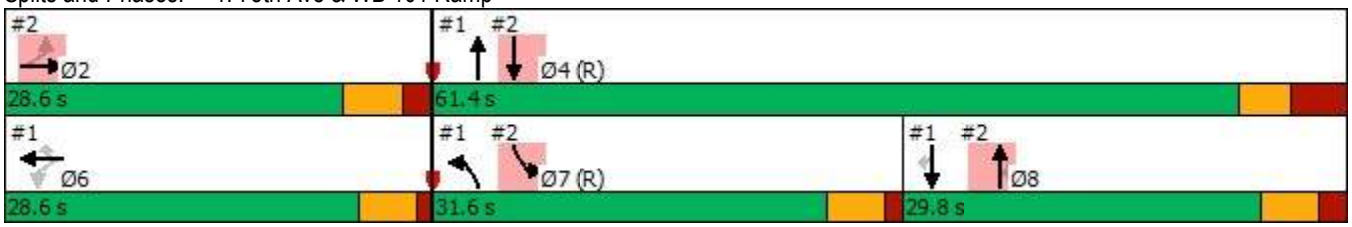


Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	760	154	1010	210	1150	1130	360	
Future Volume (vph)	760	154	1010	210	1150	1130	360	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	28.6	28.6	28.6	31.6	28.6	29.8	29.8	26.3
Total Split (s)	28.6	28.6	28.6	31.6	61.4	29.8	29.8	28.6
Total Split (%)	31.8%	31.8%	31.8%	35.1%	68.2%	33.1%	33.1%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.5	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	-0.9	-0.9	-0.9	-1.2	-3.4	-1.9	-1.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	24.6	24.6	24.6	27.6	57.4	25.8	25.8	
Actuated g/C Ratio	0.27	0.27	0.27	0.31	0.64	0.29	0.29	
v/c Ratio	1.22	1.21dr	1.15	0.42	0.55	0.57	0.53	
Control Delay	149.5	123.3	115.1	51.3	13.4	28.6	5.8	
Queue Delay	0.1	0.1	0.0	0.0	0.6	0.0	0.0	
Total Delay	149.6	123.4	115.1	51.3	14.0	28.6	5.8	
LOS	F	F	F	D	B	C	A	
Approach Delay		127.9			19.7	23.1		
Approach LOS		F			B	C		

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 64.4	Intersection LOS: E
Intersection Capacity Utilization 115.3%	ICU Level of Service H
Analysis Period (min) 15	

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

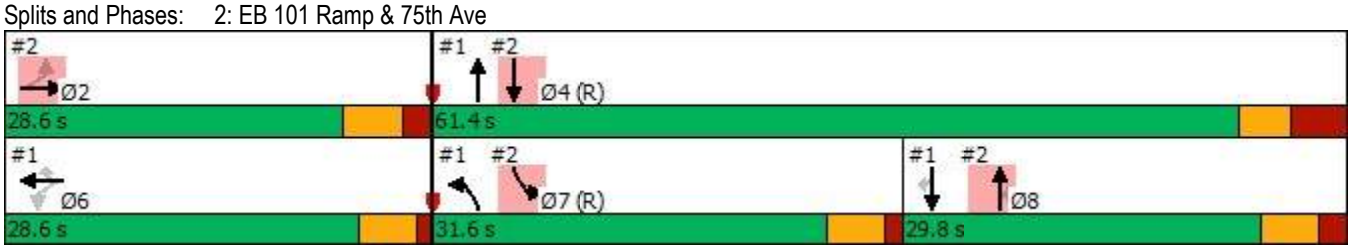
Splits and Phases: 1: 75th Ave & WB 101 Ramp



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	560	37	800	610	820	1070	
Future Volume (vph)	560	37	800	610	820	1070	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	26.3	26.3	29.8	29.8	31.6	28.6	28.6
Total Split (s)	28.6	28.6	29.8	29.8	31.6	61.4	28.6
Total Split (%)	31.8%	31.8%	33.1%	33.1%	35.1%	68.2%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.5	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.2	-3.4	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	None
Act Effct Green (s)	24.6	24.6	25.8	25.8	27.6	57.4	
Actuated g/C Ratio	0.27	0.27	0.29	0.29	0.31	0.64	
v/c Ratio	0.69	0.39	0.60	0.87	0.58	0.52	
Control Delay	38.8	28.2	29.7	24.8	52.9	15.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	1.4	
Total Delay	38.8	28.2	29.7	24.8	52.9	16.8	
LOS	D	C	C	C	D	B	
Approach Delay		33.1	27.5			32.5	
Approach LOS		C	C			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 30.8	Intersection LOS: C
Intersection Capacity Utilization 115.3%	ICU Level of Service H
Analysis Period (min) 15	

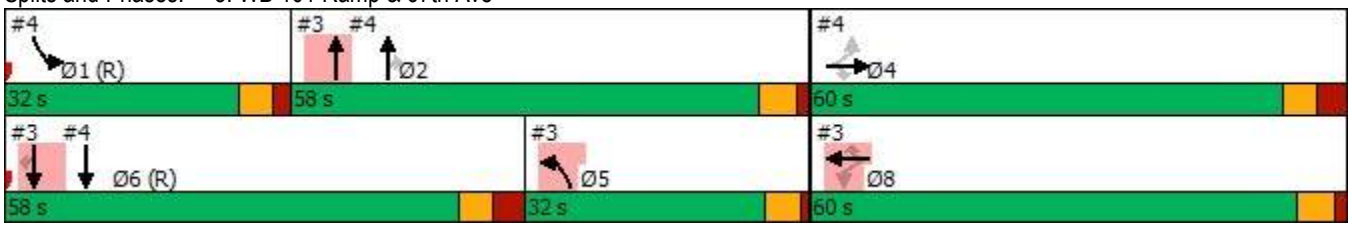
Splits and Phases: 2: EB 101 Ramp & 75th Ave



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø1	Ø4
Lane Configurations									
Traffic Volume (vph)	870	647	750	360	1300	1140	380		
Future Volume (vph)	870	647	750	360	1300	1140	380		
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm		
Protected Phases		8		5	2	6		1	4
Permitted Phases	8		8				6		
Detector Phase	8	8	8	5	2	6	6		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	5.0	6.0	6.0	6.0	10.0	8.0
Minimum Split (s)	31.9	31.9	31.9	28.0	27.9	25.4	25.4	29.9	25.4
Total Split (s)	60.0	60.0	60.0	32.0	58.0	58.0	58.0	32.0	60.0
Total Split (%)	40.0%	40.0%	40.0%	21.3%	38.7%	38.7%	38.7%	21%	40%
Yellow Time (s)	4.3	4.3	4.3	3.9	4.3	3.9	3.9	3.9	3.9
All-Red Time (s)	1.6	1.6	1.6	1.2	1.6	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.1	-1.9	-3.4	-3.4		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Lead/Lag				Lag	Lag	Lead	Lead	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	Max	Max	C-Max	C-Max	C-Max	Max
Act Effct Green (s)	56.0	56.0	56.0	28.0	54.0	54.0	54.0		
Actuated g/C Ratio	0.37	0.37	0.37	0.19	0.36	0.36	0.36		
v/c Ratio	0.79	1.23	0.72	1.18	1.11	0.46	0.66		
Control Delay	52.6	150.7	16.7	130.7	107.6	37.4	37.9		
Queue Delay	10.9	0.9	0.0	0.0	0.3	0.1	0.0		
Total Delay	63.6	151.6	16.7	130.7	107.9	37.5	37.9		
LOS	E	F	B	F	F	D	D		
Approach Delay		103.5			112.8	37.6			
Approach LOS		F			F	D			

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.23	
Intersection Signal Delay: 87.9	Intersection LOS: F
Intersection Capacity Utilization 112.7%	ICU Level of Service H
Analysis Period (min) 15	

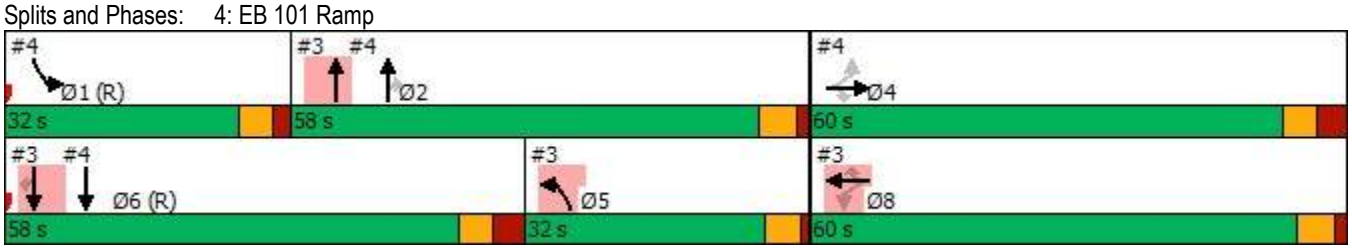
Splits and Phases: 3: WB 101 Ramp & 67th Ave



Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT	Ø5	Ø8
Lane Configurations									
Traffic Volume (vph)	720	239	230	940	540	670	1340		
Future Volume (vph)	720	239	230	940	540	670	1340		
Turn Type	Perm	NA	Perm	NA	Perm	Prot	NA		
Protected Phases		4		2		1	6	5	8
Permitted Phases	4		4		2				
Detector Phase	4	4	4	2	2	1	6		
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	6.0	6.0	10.0	6.0	5.0	10.0
Minimum Split (s)	25.4	25.4	25.4	27.9	27.9	29.9	25.4	28.0	31.9
Total Split (s)	60.0	60.0	60.0	58.0	58.0	32.0	58.0	32.0	60.0
Total Split (%)	40.0%	40.0%	40.0%	38.7%	38.7%	21.3%	38.7%	21%	40%
Yellow Time (s)	3.9	3.9	3.9	4.3	4.3	3.9	3.9	3.9	4.3
All-Red Time (s)	3.5	3.5	3.5	1.6	1.6	2.0	3.5	1.2	1.6
Lost Time Adjust (s)	-3.4	-3.4	-3.4	-1.9	-1.9	-1.9	-3.4		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Lead/Lag				Lag	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max	Max	Max	Max	C-Max	C-Max	Max	None
Act Effct Green (s)	56.0	56.0	56.0	54.0	54.0	28.0	54.0		
Actuated g/C Ratio	0.37	0.37	0.37	0.36	0.36	0.19	0.36		
v/c Ratio	0.83	0.49	0.33	0.56	0.77	0.78	1.14		
Control Delay	56.3	37.6	5.0	39.9	27.8	31.5	107.0		
Queue Delay	51.8	0.5	0.0	0.7	0.0	0.0	0.4		
Total Delay	108.1	38.1	5.0	40.6	27.8	31.5	107.4		
LOS	F	D	A	D	C	C	F		
Approach Delay		59.5		35.9			82.1		
Approach LOS		E		D			F		

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 1:SBL and 6:SBT, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.23	
Intersection Signal Delay: 61.8	Intersection LOS: E
Intersection Capacity Utilization 112.7%	ICU Level of Service H
Analysis Period (min) 15	

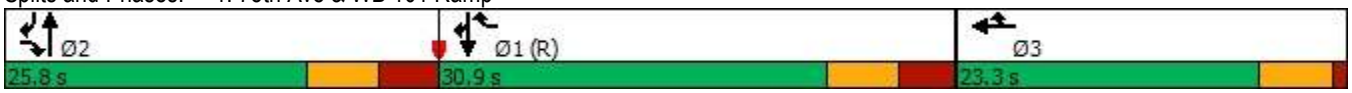
Splits and Phases: 4: EB 101 Ramp



Lane Group	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	380	43	580	590	120	1520	340
Future Volume (vph)	380	43	580	590	120	1520	340
Turn Type	Prot	NA	custom	NA	Free	NA	custom
Protected Phases	2	3	1 3	2		1	1 2
Permitted Phases					Free		
Detector Phase	2	3	1 3	2		1	1 2
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0		5.0	
Minimum Split (s)	25.8	23.3		25.8		25.8	
Total Split (s)	25.8	23.3		25.8		30.9	
Total Split (%)	32.3%	29.1%		32.3%		38.6%	
Yellow Time (s)	4.3	4.3		4.3		4.3	
All-Red Time (s)	3.5	1.0		3.5		3.5	
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	
Total Lost Time (s)	7.8	5.3		7.8		7.8	
Lead/Lag	Lead			Lead		Lag	
Lead-Lag Optimize?	Yes			Yes		Yes	
Recall Mode	Max	Max		Max		C-Max	
Act Effct Green (s)	18.0	18.0	46.4	18.0	80.0	23.1	48.9
Actuated g/C Ratio	0.22	0.22	0.58	0.22	1.00	0.29	0.61
v/c Ratio	0.32	0.11	0.38	0.81	0.08	0.89	0.33
Control Delay	0.7	25.6	8.8	26.9	0.5	34.9	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.7	25.6	8.8	26.9	0.5	34.9	1.7
LOS	A	C	A	C	A	C	A
Approach Delay		10.0		22.5		28.8	
Approach LOS		B		C		C	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 64 (80%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 21.3	Intersection LOS: C
Intersection Capacity Utilization 49.6%	ICU Level of Service A
Analysis Period (min) 15	

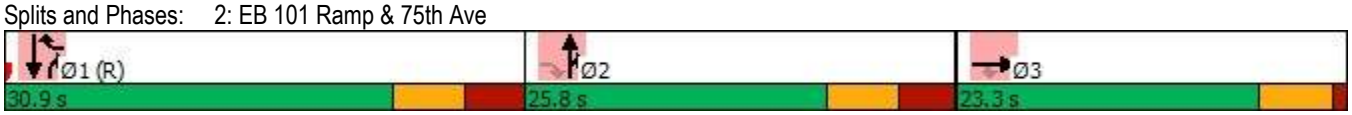
Splits and Phases: 1: 75th Ave & WB 101 Ramp



Lane Group	EBT	EBR	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	87	50	330	380	400	640	1260
Future Volume (vph)	87	50	330	380	400	640	1260
Turn Type	NA	custom	Prot	NA	custom	NA	Free
Protected Phases	3		1	2	1 2	1	
Permitted Phases		2 3					Free
Detector Phase	3	2 3	1	2	1 2	1	
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0		5.0	
Minimum Split (s)	23.3		25.8	25.8		25.8	
Total Split (s)	23.3		30.9	25.8		30.9	
Total Split (%)	29.1%		38.6%	32.3%		38.6%	
Yellow Time (s)	4.3		4.3	4.3		4.3	
All-Red Time (s)	1.0		3.5	3.5		3.5	
Lost Time Adjust (s)	0.0		0.0	0.0		0.0	
Total Lost Time (s)	5.3		7.8	7.8		7.8	
Lead/Lag			Lead	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes		Yes	
Recall Mode	None		C-Max	Max		C-Max	
Act Effct Green (s)	9.4	32.7	33.9	18.0	61.3	33.9	80.0
Actuated g/C Ratio	0.12	0.41	0.42	0.22	0.77	0.42	1.00
v/c Ratio	0.44	0.08	0.35	0.36	0.33	0.46	0.49
Control Delay	38.3	3.2	0.9	27.2	1.2	11.7	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.3	3.2	0.9	27.2	1.2	11.7	9.9
LOS	D	A	A	C	A	B	A
Approach Delay	25.6			13.9		10.5	
Approach LOS	C			B		B	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 11.0	Intersection LOS: B
Intersection Capacity Utilization 40.8%	ICU Level of Service A
Analysis Period (min) 15	

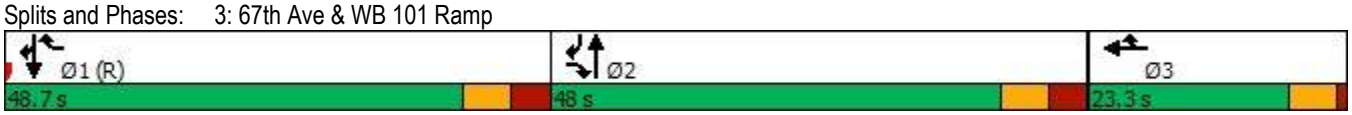
Splits and Phases: 2: EB 101 Ramp & 75th Ave



Lane Group	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	800	117	420	880	230	1700	410
Future Volume (vph)	800	117	420	880	230	1700	410
Turn Type	Prot	NA	custom	NA	Free	NA	custom
Protected Phases	2	3	1 3	2		1	1 2
Permitted Phases					Free		
Detector Phase	2	3	1 3	2		1	1 2
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0		5.0	
Minimum Split (s)	25.8	23.3		25.8		25.8	
Total Split (s)	48.0	23.3		48.0		48.7	
Total Split (%)	40.0%	19.4%		40.0%		40.6%	
Yellow Time (s)	4.3	4.3		4.3		4.3	
All-Red Time (s)	3.5	1.0		3.5		3.5	
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	
Total Lost Time (s)	7.8	5.3		7.8		7.8	
Lead/Lag	Lag			Lag		Lead	
Lead-Lag Optimize?	Yes			Yes		Yes	
Recall Mode	Max	None		Max		C-Max	
Act Effct Green (s)	40.2	15.5	64.2	40.2	120.0	43.4	91.4
Actuated g/C Ratio	0.34	0.13	0.54	0.34	1.00	0.36	0.76
v/c Ratio	0.66	0.53	0.30	0.81	0.16	0.80	0.35
Control Delay	12.9	56.6	14.5	19.3	1.9	37.9	1.7
Queue Delay	0.1	0.0	0.0	7.6	0.0	1.5	0.0
Total Delay	13.0	56.6	14.5	26.9	1.9	39.4	1.7
LOS	B	E	B	C	A	D	A
Approach Delay		23.7		21.8		32.0	
Approach LOS		C		C		C	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 7 (6%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 25.2	Intersection LOS: C
Intersection Capacity Utilization 65.6%	ICU Level of Service C
Analysis Period (min) 15	

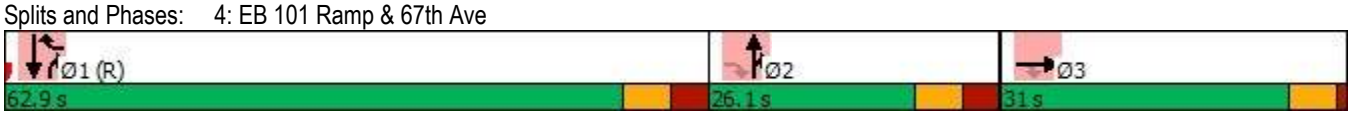
Splits and Phases: 3: 67th Ave & WB 101 Ramp



Lane Group	EBT	EBR	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	370	180	400	710	570	1430	1070
Future Volume (vph)	370	180	400	710	570	1430	1070
Turn Type	NA	custom	Prot	NA	custom	NA	Free
Protected Phases	3		1	2	1 2	1	
Permitted Phases		2 3					Free
Detector Phase	3	2 3	1	2	1 2	1	
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0		5.0	
Minimum Split (s)	23.3		25.8	25.8		25.8	
Total Split (s)	31.0		62.9	26.1		62.9	
Total Split (%)	25.8%		52.4%	21.8%		52.4%	
Yellow Time (s)	4.3		4.3	4.3		4.3	
All-Red Time (s)	1.0		3.5	3.5		3.5	
Lost Time Adjust (s)	0.0		0.0	0.0		0.0	
Total Lost Time (s)	5.3		7.8	7.8		7.8	
Lead/Lag			Lead	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes		Yes	
Recall Mode	None		C-Max	Max		C-Max	
Act Effct Green (s)	25.7	49.3	55.1	18.3	81.2	55.1	120.0
Actuated g/C Ratio	0.21	0.41	0.46	0.15	0.68	0.46	1.00
v/c Ratio	1.01	0.29	0.23	1.00	0.56	0.96	0.42
Control Delay	94.8	19.4	0.3	82.4	10.8	34.6	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	21.8	0.0
Total Delay	94.8	19.4	0.3	82.4	10.8	56.4	7.7
LOS	F	B	A	F	B	E	A
Approach Delay	70.1			50.5		35.5	
Approach LOS	E			D		D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 40.6	Intersection LOS: D
Intersection Capacity Utilization 69.9%	ICU Level of Service C
Analysis Period (min) 15	

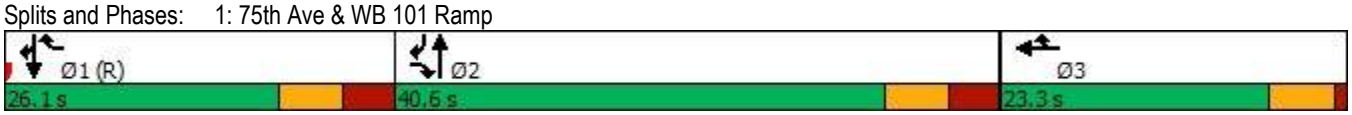
Splits and Phases: 4: EB 101 Ramp & 67th Ave



Lane Group	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	760	154	1010	1150	210	1130	360
Future Volume (vph)	760	154	1010	1150	210	1130	360
Turn Type	Prot	NA	custom	NA	Free	NA	custom
Protected Phases	2	3	1 3	2		1	1 2
Permitted Phases					Free		
Detector Phase	2	3	1 3	2		1	1 2
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0		5.0	
Minimum Split (s)	25.8	23.3		25.8		25.8	
Total Split (s)	40.6	23.3		40.6		26.1	
Total Split (%)	45.1%	25.9%		45.1%		29.0%	
Yellow Time (s)	4.3	4.3		4.3		4.3	
All-Red Time (s)	3.5	1.0		3.5		3.5	
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	
Total Lost Time (s)	7.8	5.3		7.8		7.8	
Lead/Lag	Lag			Lag		Lead	
Lead-Lag Optimize?	Yes			Yes		Yes	
Recall Mode	Max	Max		Max		C-Max	
Act Effct Green (s)	32.8	18.0	41.6	32.8	90.0	18.3	58.9
Actuated g/C Ratio	0.36	0.20	0.46	0.36	1.00	0.20	0.65
v/c Ratio	0.51	0.45	0.83	0.97	0.14	0.94	0.34
Control Delay	1.6	36.1	26.9	30.6	0.4	50.7	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.6	36.1	26.9	30.6	0.4	50.7	1.7
LOS	A	D	C	C	A	D	A
Approach Delay		28.1		25.9		38.9	
Approach LOS		C		C		D	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 7 (8%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 26.6	Intersection LOS: C
Intersection Capacity Utilization 80.1%	ICU Level of Service D
Analysis Period (min) 15	

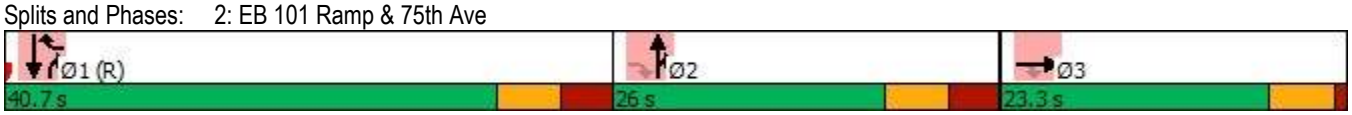
Splits and Phases: 1: 75th Ave & WB 101 Ramp



Lane Group	EBT	EBR	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	37	60	560	800	610	1070	820
Future Volume (vph)	37	60	560	800	610	1070	820
Turn Type	NA	custom	Prot	NA	custom	NA	Free
Protected Phases	3		1	2	1 2	1	
Permitted Phases		2 3					Free
Detector Phase	3	2 3	1	2	1 2	1	
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0		5.0	
Minimum Split (s)	23.3		25.8	25.8		25.8	
Total Split (s)	23.3		40.7	26.0		40.7	
Total Split (%)	25.9%		45.2%	28.9%		45.2%	
Yellow Time (s)	4.3		4.3	4.3		4.3	
All-Red Time (s)	1.0		3.5	3.5		3.5	
Lost Time Adjust (s)	0.0		0.0	0.0		0.0	
Total Lost Time (s)	5.3		7.8	7.8		7.8	
Lead/Lag			Lead	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes		Yes	
Recall Mode	None		C-Max	Max		C-Max	
Act Effct Green (s)	7.4	30.9	45.6	18.2	73.2	45.6	90.0
Actuated g/C Ratio	0.08	0.34	0.51	0.20	0.81	0.51	1.00
v/c Ratio	0.26	0.11	0.56	0.85	0.47	0.65	0.32
Control Delay	42.3	7.0	4.6	43.7	1.4	12.6	6.4
Queue Delay	0.0	0.0	0.0	1.2	0.0	0.2	0.0
Total Delay	42.3	7.0	4.6	44.9	1.4	12.9	6.4
LOS	D	A	A	D	A	B	A
Approach Delay	20.4			26.1		10.0	
Approach LOS	C			C		B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 15.2	Intersection LOS: B
Intersection Capacity Utilization 63.1%	ICU Level of Service B
Analysis Period (min) 15	

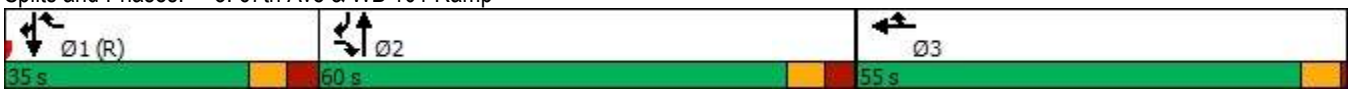
Splits and Phases: 2: EB 101 Ramp & 75th Ave



Lane Group	EBR	WBT	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	870	647	750	1300	360	1140	380
Future Volume (vph)	870	647	750	1300	360	1140	380
Turn Type	Prot	NA	custom	NA	Free	NA	custom
Protected Phases	2	3	1 3	2		1	1 2
Permitted Phases					Free		
Detector Phase	2	3	1 3	2		1	1 2
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0		5.0	
Minimum Split (s)	25.8	23.3		25.8		25.8	
Total Split (s)	60.0	55.0		60.0		35.0	
Total Split (%)	40.0%	36.7%		40.0%		23.3%	
Yellow Time (s)	4.3	4.3		4.3		4.3	
All-Red Time (s)	3.5	1.0		3.5		3.5	
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	
Total Lost Time (s)	7.8	5.3		7.8		7.8	
Lead/Lag	Lag			Lag		Lead	
Lead-Lag Optimize?	Yes			Yes		Yes	
Recall Mode	Max	None		Max		C-Max	
Act Effct Green (s)	52.2	49.7	82.2	52.2	150.0	27.2	87.2
Actuated g/C Ratio	0.35	0.33	0.55	0.35	1.00	0.18	0.58
v/c Ratio	0.53	1.14	0.53	1.15	0.25	1.07	0.44
Control Delay	1.1	126.0	22.0	105.2	4.2	103.4	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.2	126.0	22.0	105.2	4.2	103.4	16.2
LOS	A	F	C	F	A	F	B
Approach Delay		70.2		83.3		81.6	
Approach LOS		E		F		F	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 22 (15%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 66.3	Intersection LOS: E
Intersection Capacity Utilization 80.9%	ICU Level of Service D
Analysis Period (min) 15	

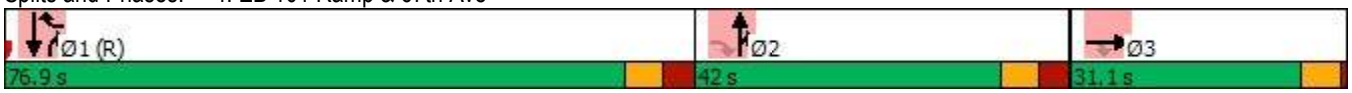
Splits and Phases: 3: 67th Ave & WB 101 Ramp



Lane Group	EBT	EBR	WBR	NBT	NBR	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	239	230	720	940	540	1340	670
Future Volume (vph)	239	230	720	940	540	1340	670
Turn Type	NA	custom	Prot	NA	custom	NA	Free
Protected Phases	3		1	2	1 2	1	
Permitted Phases		2 3					Free
Detector Phase	3	2 3	1	2	1 2	1	
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0		5.0	
Minimum Split (s)	23.3		25.8	25.8		25.8	
Total Split (s)	31.1		76.9	42.0		76.9	
Total Split (%)	20.7%		51.3%	28.0%		51.3%	
Yellow Time (s)	4.3		4.3	4.3		4.3	
All-Red Time (s)	1.0		3.5	3.5		3.5	
Lost Time Adjust (s)	0.0		0.0	0.0		0.0	
Total Lost Time (s)	5.3		7.8	7.8		7.8	
Lead/Lag			Lead	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes		Yes	
Recall Mode	None		C-Max	Max		C-Max	
Act Effct Green (s)	24.0	63.5	70.9	34.2	112.9	70.9	150.0
Actuated g/C Ratio	0.16	0.42	0.47	0.23	0.75	0.47	1.00
v/c Ratio	0.88	0.36	0.45	0.88	0.48	0.87	0.26
Control Delay	89.2	26.4	1.8	65.8	6.7	24.9	6.8
Queue Delay	0.0	0.0	0.3	0.0	0.0	6.9	0.0
Total Delay	89.2	26.4	2.0	65.8	6.7	31.8	6.8
LOS	F	C	A	E	A	C	A
Approach Delay	58.4			44.2		23.5	
Approach LOS	E			D		C	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 1:SBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 30.2	Intersection LOS: C
Intersection Capacity Utilization 64.3%	ICU Level of Service C
Analysis Period (min) 15	

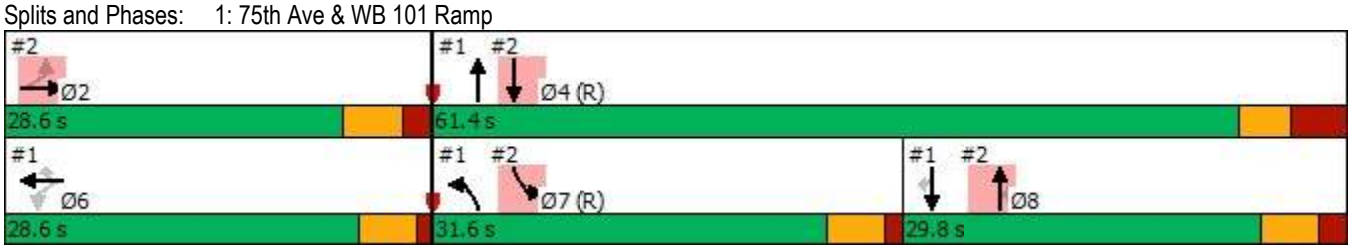
Splits and Phases: 4: EB 101 Ramp & 67th Ave



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	380	43	580	120	590	420	340	
Future Volume (vph)	380	43	580	120	590	420	340	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	28.6	28.6	28.6	31.6	28.6	29.8	29.8	26.3
Total Split (s)	28.6	28.6	28.6	31.6	61.4	29.8	29.8	28.6
Total Split (%)	31.8%	31.8%	31.8%	35.1%	68.2%	33.1%	33.1%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.5	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	-0.9	-0.9	-0.9	-1.2	-3.4	-1.9	-1.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	24.6	24.6	24.6	27.6	57.4	25.8	25.8	
Actuated g/C Ratio	0.27	0.27	0.27	0.31	0.64	0.29	0.29	
v/c Ratio	0.61	0.51	0.52	0.24	0.28	0.43	0.52	
Control Delay	35.4	13.0	7.6	50.7	12.6	27.6	5.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	35.4	13.0	7.6	50.7	12.6	27.6	5.7	
LOS	D	B	A	D	B	C	A	
Approach Delay		16.9			19.0	17.8		
Approach LOS		B			B	B		

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 50.5%	ICU Level of Service A
Analysis Period (min) 15	

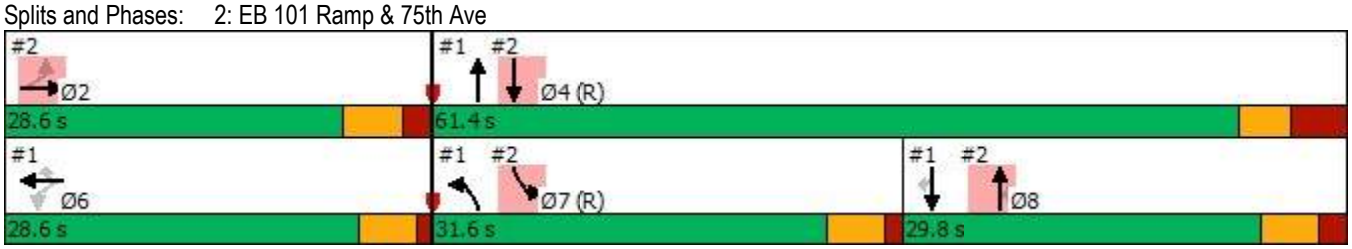
Splits and Phases: 1: 75th Ave & WB 101 Ramp



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	330	87	380	400	160	640	
Future Volume (vph)	330	87	380	400	160	640	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	26.3	26.3	29.8	29.8	31.6	28.6	28.6
Total Split (s)	28.6	28.6	29.8	29.8	31.6	61.4	28.6
Total Split (%)	31.8%	31.8%	33.1%	33.1%	35.1%	68.2%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.5	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.2	-3.4	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	None
Act Effct Green (s)	24.6	24.6	25.8	25.8	27.6	57.4	
Actuated g/C Ratio	0.27	0.27	0.29	0.29	0.31	0.64	
v/c Ratio	0.41	0.37	0.28	0.57	0.17	0.31	
Control Delay	30.1	25.9	25.6	5.9	47.3	11.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.3	
Total Delay	30.1	25.9	25.6	5.9	47.3	11.4	
LOS	C	C	C	A	D	B	
Approach Delay		27.4	15.5			18.6	
Approach LOS		C	B			B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 19.4	Intersection LOS: B
Intersection Capacity Utilization 50.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: EB 101 Ramp & 75th Ave

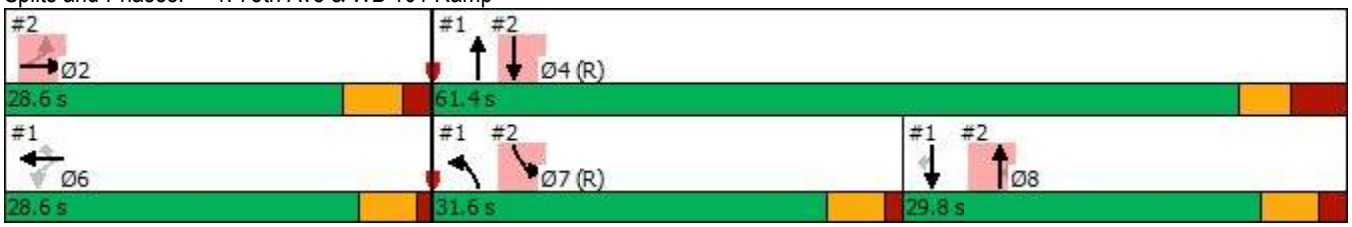


Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations								
Traffic Volume (vph)	760	154	1010	210	1150	470	360	
Future Volume (vph)	760	154	1010	210	1150	470	360	
Turn Type	Perm	NA	Perm	Prot	NA	NA	Perm	
Protected Phases		6		7	4	8		2
Permitted Phases	6		6				8	
Detector Phase	6	6	6	7	4	8	8	
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	8.0	6.0	15.0	15.0	8.0
Minimum Split (s)	28.6	28.6	28.6	31.6	28.6	29.8	29.8	26.3
Total Split (s)	28.6	28.6	28.6	31.6	61.4	29.8	29.8	28.6
Total Split (%)	31.8%	31.8%	31.8%	35.1%	68.2%	33.1%	33.1%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.5	3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.3	3.9	2.0	2.0	2.0
Lost Time Adjust (s)	-0.9	-0.9	-0.9	-1.2	-3.4	-1.9	-1.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag				Lead		Lag	Lag	
Lead-Lag Optimize?				Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	24.6	24.6	24.6	27.6	57.4	25.8	25.8	
Actuated g/C Ratio	0.27	0.27	0.27	0.31	0.64	0.29	0.29	
v/c Ratio	1.22	1.21dr	1.15	0.42	0.55	0.28	0.53	
Control Delay	149.5	123.3	115.1	51.3	13.4	25.4	5.8	
Queue Delay	0.1	0.1	0.0	0.0	0.6	0.0	0.0	
Total Delay	149.6	123.4	115.1	51.3	14.0	25.4	5.8	
LOS	F	F	F	D	B	C	A	
Approach Delay		128.0			19.7	16.9		
Approach LOS		F			B	B		

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 69.8	Intersection LOS: E
Intersection Capacity Utilization 115.3%	ICU Level of Service H
Analysis Period (min) 15	

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

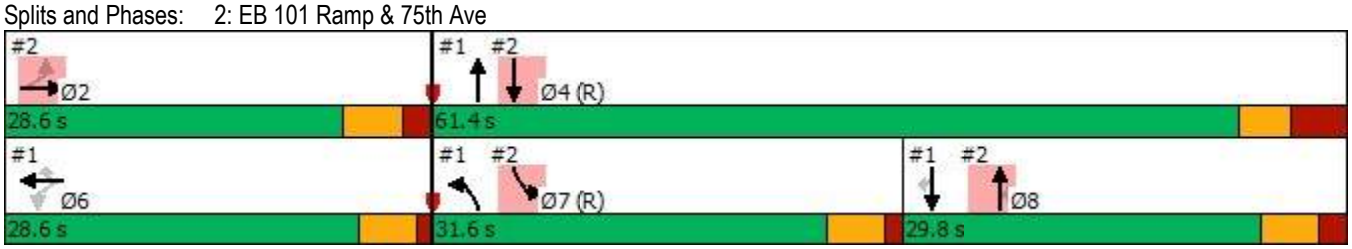
Splits and Phases: 1: 75th Ave & WB 101 Ramp



Lane Group	EBL	EBT	NBT	NBR	SBL	SBT	Ø6
Lane Configurations							
Traffic Volume (vph)	560	37	800	610	160	1070	
Future Volume (vph)	560	37	800	610	160	1070	
Turn Type	Perm	NA	NA	Perm	Prot	NA	
Protected Phases		2	8		7	4	6
Permitted Phases	2			8			
Detector Phase	2	2	8	8	7	4	
Switch Phase							
Minimum Initial (s)	8.0	8.0	15.0	15.0	8.0	6.0	10.0
Minimum Split (s)	26.3	26.3	29.8	29.8	31.6	28.6	28.6
Total Split (s)	28.6	28.6	29.8	29.8	31.6	61.4	28.6
Total Split (%)	31.8%	31.8%	33.1%	33.1%	35.1%	68.2%	32%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.5	3.9
All-Red Time (s)	2.0	2.0	2.0	2.0	1.3	3.9	1.0
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-1.2	-3.4	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lag	Lag	Lead		
Lead-Lag Optimize?			Yes	Yes	Yes		
Recall Mode	Max	Max	Max	Max	C-Max	C-Max	None
Act Effct Green (s)	24.6	24.6	25.8	25.8	27.6	57.4	
Actuated g/C Ratio	0.27	0.27	0.29	0.29	0.31	0.64	
v/c Ratio	0.69	0.39	0.60	0.72	0.17	0.52	
Control Delay	38.8	28.2	29.7	7.2	48.8	15.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	1.2	
Total Delay	38.8	28.2	29.7	7.2	48.8	17.0	
LOS	D	C	C	A	D	B	
Approach Delay		33.1	20.0			21.2	
Approach LOS		C	B			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT and 7:NBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 22.9	Intersection LOS: C
Intersection Capacity Utilization 115.3%	ICU Level of Service H
Analysis Period (min) 15	

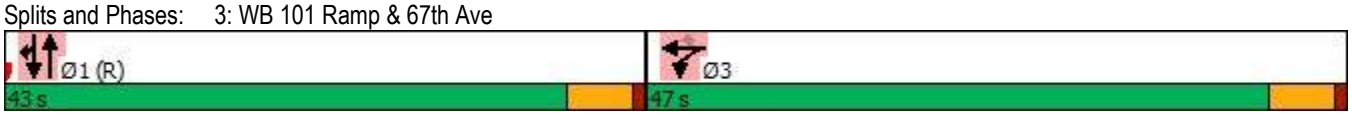
Splits and Phases: 2: EB 101 Ramp & 75th Ave



Lane Group	WBL	WBT	WBR	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	800	117	420	880	1700	410
Future Volume (vph)	800	117	420	880	1700	410
Turn Type	Split	NA	Perm	NA	NA	Prot
Protected Phases	3	3		1	1	1
Permitted Phases			3			
Detector Phase	3	3	3	1	1	1
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.3	10.3	10.3	23.3	23.3	23.3
Total Split (s)	47.0	47.0	47.0	43.0	43.0	43.0
Total Split (%)	52.2%	52.2%	52.2%	47.8%	47.8%	47.8%
Yellow Time (s)	4.3	4.3	4.3	4.3	4.3	4.3
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-3.4	-3.4
Total Lost Time (s)	3.4	3.4	3.4	3.4	1.9	1.9
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	35.9	35.9	35.9	47.3	48.8	48.8
Actuated g/C Ratio	0.40	0.40	0.40	0.53	0.54	0.54
v/c Ratio	0.68	0.57	0.52	0.51	0.53	0.42
Control Delay	27.1	20.9	18.6	3.5	15.1	2.8
Queue Delay	0.1	0.0	0.0	0.4	0.1	0.0
Total Delay	27.1	20.9	18.6	3.9	15.2	2.8
LOS	C	C	B	A	B	A
Approach Delay		22.2		3.9	12.8	
Approach LOS		C		A	B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 13.9	Intersection LOS: B
Intersection Capacity Utilization 54.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: WB 101 Ramp & 67th Ave



Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	400	370	180	230	480	570	1070	1430
Future Volume (vph)	400	370	180	230	480	570	1070	1430
Turn Type	Split	NA	Perm	Split	NA	Perm	Split	NA
Protected Phases	3	3		2	2		1	1
Permitted Phases			3			2		
Detector Phase	3	3	3	2	2	2	1	1
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.3	10.3	10.3	27.3	27.3	27.3	27.3	27.3
Total Split (s)	18.4	18.4	18.4	27.3	27.3	27.3	44.3	44.3
Total Split (%)	20.4%	20.4%	20.4%	30.3%	30.3%	30.3%	49.2%	49.2%
Yellow Time (s)	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
All-Red Time (s)	1.0	1.0	1.0	5.0	5.0	5.0	2.5	2.5
Lost Time Adjust (s)	-3.4	-3.4	-3.4	0.0	-1.9	-1.9	-1.9	-3.4
Total Lost Time (s)	1.9	1.9	1.9	9.3	7.4	7.4	4.9	3.4
Lead/Lag				Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	C-Max	C-Max
Act Effct Green (s)	16.5	16.5	16.5	18.0	19.9	19.9	39.4	40.9
Actuated g/C Ratio	0.18	0.18	0.18	0.20	0.22	0.22	0.44	0.45
v/c Ratio	0.94	0.91	0.29	0.71	0.67	0.88	0.77	0.97
Control Delay	78.1	57.6	6.2	45.9	36.9	44.0	29.3	33.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	48.9	3.0
Total Delay	78.1	57.6	6.2	45.9	36.9	44.0	78.2	36.0
LOS	E	E	A	D	D	D	E	D
Approach Delay		53.4			41.7			54.1
Approach LOS		D			D			D

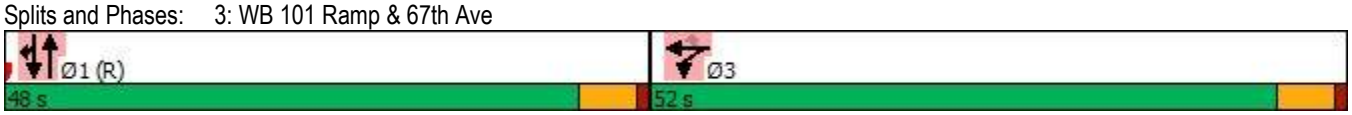
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 28 (31%), Referenced to phase 1:SBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 50.6	Intersection LOS: D
Intersection Capacity Utilization 80.2%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 4: EB 101 Ramp

Lane Group	WBL	WBT	WBR	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	870	647	750	1300	1140	380
Future Volume (vph)	870	647	750	1300	1140	380
Turn Type	Split	NA	Perm	NA	NA	Prot
Protected Phases	3	3		1	1	1
Permitted Phases			3			
Detector Phase	3	3	3	1	1	1
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.3	10.3	10.3	23.3	23.3	23.3
Total Split (s)	52.0	52.0	52.0	48.0	48.0	48.0
Total Split (%)	52.0%	52.0%	52.0%	48.0%	48.0%	48.0%
Yellow Time (s)	4.3	4.3	4.3	4.3	4.3	4.3
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-3.4	-3.4
Total Lost Time (s)	3.4	3.4	3.4	3.4	1.9	1.9
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	48.6	48.6	48.6	44.6	46.1	46.1
Actuated g/C Ratio	0.49	0.49	0.49	0.45	0.46	0.46
v/c Ratio	0.60	0.95	0.80	0.90	0.42	0.51
Control Delay	22.8	38.9	30.9	11.5	18.6	13.4
Queue Delay	0.4	18.7	0.0	3.7	0.1	0.0
Total Delay	23.2	57.6	30.9	15.2	18.6	13.4
LOS	C	E	C	B	B	B
Approach Delay		44.8		15.2	17.3	
Approach LOS		D		B	B	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 29.0	Intersection LOS: C
Intersection Capacity Utilization 76.7%	ICU Level of Service D
Analysis Period (min) 15	

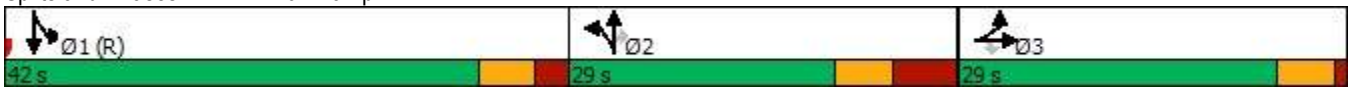
Splits and Phases: 3: WB 101 Ramp & 67th Ave



Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	720	239	230	360	580	540	670	1340
Future Volume (vph)	720	239	230	360	580	540	670	1340
Turn Type	Split	NA	Perm	Split	NA	Perm	Split	NA
Protected Phases	3	3		2	2		1	1
Permitted Phases			3			2		
Detector Phase	3	3	3	2	2	2	1	1
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	14.3	14.3	14.3	27.3	27.3	27.3	27.3	27.3
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	42.0	42.0
Total Split (%)	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	42.0%	42.0%
Yellow Time (s)	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
All-Red Time (s)	1.0	1.0	1.0	5.0	5.0	5.0	2.5	2.5
Lost Time Adjust (s)	-3.4	-3.4	-3.4	0.0	-1.9	-1.9	-1.9	-3.4
Total Lost Time (s)	1.9	1.9	1.9	9.3	7.4	7.4	4.9	3.4
Lead/Lag				Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	C-Max	C-Max
Act Effct Green (s)	27.1	27.1	27.1	19.7	21.6	21.6	37.1	38.6
Actuated g/C Ratio	0.27	0.27	0.27	0.20	0.22	0.22	0.37	0.39
v/c Ratio	1.15	0.61	0.27	1.12	0.82	0.70	0.57	1.07
Control Delay	125.5	35.2	4.5	124.4	47.8	21.8	29.5	70.4
Queue Delay	1.2	0.2	0.0	0.0	0.0	0.0	1.4	14.0
Total Delay	126.7	35.4	4.5	124.4	47.8	21.8	30.9	84.4
LOS	F	D	A	F	D	C	C	F
Approach Delay		64.8			56.9			66.6
Approach LOS		E			E			E

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 38 (38%), Referenced to phase 1:SBTL, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 63.1	Intersection LOS: E
Intersection Capacity Utilization 89.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 4: EB 101 Ramp



Appendix F

Table 1 – 75th Avenue TI Existing

Intersection	Approach	Movement	a.m. Peak Hour (2018)		p.m. Peak Hour (2018)	
			Delay (s)	LOS	Delay (s)	LOS
75th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	48.1	D	49.9	D
		T	14.2	B	40.2	D
		R	5.5	A	38.3	D
	NB	L	78.7	E	70.1	E
		T	29	C	27.1	C
	SB	T	130.2	F	46.5	D
		R	24.5	C	6.9	A
	Overall		**71.1**	**E**	**37.7**	**D**
75th Ave & EB 101 Ramp	EB	L	43	D	33.0	C
		T	39.5	D	27.9	C
		R	39.5	D	27.9	C
	WB	-	-	-	-	-
	NB	T	60.1	E	45.2	D
		R	8.8	A	11.5	B
	SB	L	162.5	F	132.5	F
		T	25.5	C	18.6	B
	Overall		**87**	**F**	**50.1**	**D**

Table 2 – 75th Avenue TI No Build Future

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
75th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	61.6	E	103.5	F
		T	24.6	C	94.0	F
		R	11.5	B	50.9	D
	NB	L	80.3	F	74.5	E
		T	28.8	C	35.2	D
	SB	T	151.2	F	48.9	D
		R	35.1	D	7.1	A
	Overall		**83.5**	**F**	**58.2**	**E**
75th Ave & EB 101 Ramp	EB	L	43.9	D	351	D
		T	40.6	D	28.8	C
		R	40.6	D	28.8	C
	WB	-	-	-	-	-
	NB	T	61.2	E	47.4	D
		R	12.6	B	23.6	C
	SB	L	178.4	F	133.6	F
		T	29.8	C	24.8	C
	Overall		**92.7**	**F**	**52.8**	**D**

Table 3 – 75th Avenue TI Triple Left Turn Future (Braided Ramps)

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
75th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	26.3	C	34.1	C
		T	20.2	C	30.5	C
		R	7.9	A	44.6	D
	NB	L	46.5	D	53.9	D
		T	12.3	B	12.9	B
	SB	T	36.4	D	24.0	C
		R	34.0	C	10.3	B
	Overall		**26.24**	**C**	**27.0**	**C**
75th Ave & EB 101 Ramp	EB	L	26.7	C	26.6	C
		T	28.7	C	22.5	C
		R	12.3	B	24.9	C
	WB	-	-	-	-	-
	NB	T	30.9	C	34.8	C
		R	47.3	D	58.9	E
	SB	L	47.6	D	55.8	E
		T	13.5	B	12.4	B
	Overall		**32.6**	**C**	**32.0**	**C**

Table 4 – 75th Avenue TI Triple Left Turn Future (67th Off Ramp Relocation)

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
75th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	26.4	C	27.6	C
		T	21.6	C	23.9	C
		R	28.0	C	32.1	C
	NB	L	46.6	D	57.4	E
		T	11.7	B	11.9	B
	SB	T	36.4	D	22.9	C
		R	34.0	C	11.4	B
	Overall		**29.3**	**C**	**23.2**	**C**
75th Ave & EB 101 Ramp	EB	L	27.0	C	23.3	C
		T	31.0	C	27.9	C
		R	29.3	C	24.5	C
	WB	-	-	-	-	-
	NB	T	30.8	C	30.0	C
		R	47.1	D	49.0	D
	SB	L	47.6	D	58.6	E
		T	13.5	B	14.4	B
	Overall		**32.5**	**C**	**29.7**	**C**

Table 5 – 75th Avenue TI DDI Future

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
75th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	7.4	A	10.6	B
		T	31.9	C	33.2	C
		R	13.4	B	18.4	B
	NB	L	1.0	A	1.4	A
		T	34.1	C	17.0	B
	SB	T	61.5	E	34.9	C
		R	6.0	A	7.3	A
	Overall		**36.4**	**D**	**19.8**	**B**
75th Ave & EB 101 Ramp	EB	L	10.1	B	10.6	B
		T	27.2	C	31.8	C
		R	9.4	A	12.8	B
	WB	-	-	-	-	-
	NB	L	26.3	C	36.2	D
		R	8.5	A	9.9	A
	SB	L	2.4	A	1.5	A
		T	16.1	B	21.5	C
	Overall		**11.5**	**B**	**18.5**	**B**

Table 6 – 75th Avenue Flyover

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
75th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	26.3	C	33.9	C
		T	20.5	C	30.9	C
		R	9.9	A	45.6	D
	NB	L	50.4	D	53.9	D
		T	11.5	B	12.9	B
	SB	T	24.6	C	23.0	C
		R	25.6	C	9.8	A
	Overall		**18.8**	**B**	**27.9**	**C**
75th Ave & EB 101 Ramp	EB	L	26.6	C	26.6	C
		T	28.7	C	22.5	C
		R	13.5	B	24.9	C
	WB	-	-	-	-	-
	NB	T	25.6	C	34.8	C
		R	32.0	C	58.7	E
	SB	L	50.0	D	54.9	D
		T	10.9	B	13.1	B
	Overall		**23.4**	**C**	**30.6**	**C**

Table 7 – 67th Avenue TI Existing

Intersection	Approach	Movement	a.m. Peak Hour (2018)		p.m. Peak Hour (2018)	
			Delay (s)	LOS	Delay (s)	LOS
67th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	61.8	E	192.4	F
		T	52.0	D	182.1	F
		R	7.8	A	8.7	A
	NB	L	45.5	D	48.0	D
		T	105.5	F	158.4	F
	SB	T	28.2	C	38.8	D
		R	3.9	A	17.0	B
	Overall		**46.6**	**D**	**108.9**	**F**
67th Ave & EB 101 Ramp	EB	L	52.4	D	96.1	F
		T	48.5	D	55.4	E
		R	6.1	A	8.3	A
	WB	-	-	-	-	-
	NB	T	45.3	D	39.8	D
		R	50.1	D	24.6	C
	SB	L	57.2	E	55.0	E
		T	21.2	C	72.7	E
	Overall		**41.5**	**D**	**55.7**	**E**

Table 8 – 67th Avenue TI No Build Future

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
67th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	140.4	F	349.4	F
		T	113.3	F	363.1	F
		R	8.1	A	9.6	A
	NB	L	53.2	D	75.7	E
		T	150.4	F	216.4	F
	SB	T	30.1	C	41.4	D
		R	10.8	B	34.3	C
	Overall		**72.9**	**E**	**183.8**	**F**
67th Ave & EB 101 Ramp	EB	L	60.4	E	122.0	F
		T	55.8	E	98.7	F
		R	8.2	A	8.2	A
	WB	-	-	-	-	-
	NB	T	52.7	D	54.2	D
		R	208.6	F	94.6	F
	SB	L	95.9	F	55.2	E
		T	55.0	E	222.6	F
	Overall		**81.2**	**F**	**116.3**	**F**

Table 9 – 67th Avenue TI Triple Left Turn Future

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
67th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	46.2	D	74.0	E
		T	33.9	C	62.5	E
		R	31.3	C	62.8	E
	NB	L	23.7	C	28.6	C
		T	10.4	B	16.2	B
	SB	T	19.8	B	29.1	C
		R	9.8	A	12.7	B
	Overall		**23.21**	**C**	**40.2**	**D**
67th Ave & EB 101 Ramp	EB	L	30.2	C	31.3	C
		T	32.4	C	27.6	C
		R	30.3	C	26.0	C
	WB	-	-	-	-	-
	NB	T	24.9	C	34.5	C
		R	34.1	C	46.1	D
	SB	L	36.4	D	28.1	C
		T	10.2	B	13.1	B
	Overall		**23.52**	**C**	**26.6**	**C**

Table 10 – 67th Avenue TI Roundabouts Future

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
67th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	36.0	D	156.1	F
		T	31.7	C	153.1	F
		R	14.7	B	72.2	E
	NB	L	9.5	A	0.7	A
		T	9.7	A	1.0	A
	SB	T	129.7	F	65.0	E
		R	49.9	D	22.0	C
	Overall		**53.3**	**D**	**57.8**	**E**
67th Ave & EB 101 Ramp	EB	L	405.9	F	350.8	F
		T	462.3	F	505.4	F
		R	185.4	F	143.3	F
	WB	-	-	-	-	-
	NB	T	30.2	C	22.2	C
		R	1.0	A	0.7	A
	SB	L	6.1	A	8.1	A
		T	12.6	B	8.4	A
	Overall		**71.2**	**E**	**63.6**	**E**

Table 11 – 67th Avenue TI DDI Future

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
67th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	23.6	C	10.9	B
		T	43.3	D	186.6	F
		R	11.5	B	27.6	C
	NB	L	2.1	A	1.5	A
		T	22.6	C	26.6	C
	SB	T	29.4	C	131.9	F
		R	6.8	A	40.2	D
	Overall		**22.7**	**C**	**63.6**	**E**
67th Ave & EB 101 Ramp	EB	L	36.8	D	29.0	C
		T	121.2	F	69.0	E
		R	17.7	B	100.7	F
	WB	-	-	-	-	-
	NB	L	69.1	E	59.1	E
		R	10.5	B	10.9	B
	SB	L	1.5	A	1.6	A
		T	17.6	B	13.0	B
	Overall		**30.6**	**C**	**37.8**	**D**

Table 12 – 67th Avenue TI CFI Future

Intersection	Approach	Movement	a.m. Peak Hour (2040)		p.m. Peak Hour (2040)	
			Delay (s)	LOS	Delay (s)	LOS
67th Ave & WB 101 Ramp	EB	-	-	-	-	-
	WB	L	15.9	B	170.2	F
		T	18.8	B	177.3	F
		R	13.9	B	165.8	F
	NB	L	0.6	A	0.7	A
		T	6.1	A	14.9	B
	SB	T	17.7	B	25.3	C
		R	15.7	B	18.1	B
	Overall		**13**	**B**	**64.3**	**E**
67th Ave & EB 101 Ramp	EB	L	38.6	D	78.1	E
		T	37.2	D	39.5	D
		R	15	B	12.9	B
	WB	-	-	-	-	-
	NB	L	35.2	D	30.9	C
		T	42.4	D	37	D
		R	40.6	D	32.3	C
	SB	L	15.2	B	27.9	C
		T	20.1	C	32.2	C
	Overall		**29.5**	**C**	**39.3**	**D**

Appendix G

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L
SEGMENT: 75th Ave TI
LENGTH:
ADOT PROJECT NO.:
PROJECT DESCRIPTION: Triple Lefts with Braided Ramp
ESTIMATE LEVEL: Level 0
DATE: 12/20/19

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	$ 180,000.00	180,000
	ROADWAY EXCAVATION	CU.YD.	46,000	$ 20.00	920,000
	DRAINAGE EXCAVATION	CU.YD.		$ 8.00	
	BORROW	CU.YD.		$ 16.00	
	SUBGRADE TREATMENT	SQ.YD.		$ 15.00	
	FURNISH WATER	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 200				1,100,000
300 & 400	**BASE AND SURFACE TREATMENT**				
	AGGREGATE BASE	SQ.YD.	36,380	$ 10.00	363,800
	CONCRETE PAVEMENT	SQ.YD.	34,377	$ 62.00	2,131,400
	ASPHALT PAVEMENT	SQ.YD.	2,003	$ 34.00	68,100
	ARAC SURFACE	SQ.YD.		$ 6.00	
	MILLING & OVERLAY	SQ.YD.		$ 16.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 300 & 400				2,563,300
500	**DRAINAGE**				
	DRAINAGE SYSTEM (CLOSED)	L.FT.		$ 240.00	
	DRAINAGE SYSTEM (OPEN)	L.FT.		$ 185.00	
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.		$ 415.00	
	PUMP STATION (NEW)	EACH		$ 2,500,000.00	
	PIPE CULVERTS	L.FT.		$ 365.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 500				0
600	**STRUCTURES**				
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.	20,941	$ 135.00	2,827,040
	FLYOVER HOV RAMP	SQ.FT.		$ 175.00	
	OVERPASS TI BRIDGE	SQ.FT.		$ 140.00	
	RIVER CROSSING BRIDGE	SQ.FT.		$ 145.00	
	PEDESTRIAN BRIDGE	SQ.FT.		$ 180.00	
	BRIDGE WIDENING	SQ.FT.		$ 160.00	
	BRIDGE REHABILITATION	SQ.FT.		$ 100.00	
	BOX CULVERT	L.FT./CELL		$ 1,330.00	
	SIGN STRUCTURES	EACH		$ 100,000.00	
	ITS STRUCTURE AND PANEL	EACH		$ 200,000.00	
	O&M CROSSING	EACH		$ 350,000.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 600				2,827,040
700	**TRAFFIC ENGINEERING**				
	SIGNING (FREEWAY)	MILE/DIR	1.5	$ 35,000.00	52,500
	SIGNING (STREET)	MILE	0.75	$ 65,000.00	48,750
	PAVEMENT MARKING	LANE-MILE	3.50	$ 5,000.00	17,500
	LIGHTING	MILE	0.50	$ 375,000.00	187,500
	TRAFFIC SIGNAL	EACH		$ 250,000.00	
	INTELLIGENT TRANSPORTATION SYSTEM (ITS)	MILE		$ 525,000.00	
	MISCELLANEOUS ITEMS	L.SUM		$ 1,700,000.00	
	TOTAL ITEM 700				306,250
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING AND TOPSOIL	SQ.YD.		$ 15.00	
	UTILITY RELOCATION	L.SUM	1	$ 1,000,000.00	1,000,000
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 800				1,000,000
900	**INCIDENTALS**				
	RETAINING WALLS	SQ.FT.	67,500	$ 75.00	5,062,500
	SOUND WALLS	SQ.FT.	42,750	$ 40.00	1,710,000
	ROADWAY APPURTENANCES	L.SUM	1	$ 500,000.00	500,000
	ADA IMPROVEMENTS	EACH		$ 2,500.00	
	TRANSIT APPURTENANCES	L.SUM			
	RAILROAD ACCOMMODATIONS	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 900				7,272,500
	SUBTOTAL A (ITEM SUBTOTAL)				**$15,069,100**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L **PROJECT DESCRIPTION:** Triple Lefts with Braided Ramp
SEGMENT: 75th Ave TI **ESTIMATE LEVEL:** Level 0
LENGTH: **ADOT PROJECT NO.:** **DATE:** 12/20/19

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
PW	**PROJECT WIDE**				
	TRAFFIC CONTROL (8% OF SUBTOTAL A)			8.0%	1,205,500
	DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER)			0.0%	0
	QUALITY CONTROL (1% OF SUBTOTAL A)			1.0%	150,700
	CONSTRUCTION SURVEYING (1.5% OF SUBTOTAL A)			1.5%	226,000
	EROSION CONTROL (1% OF SUBTOTAL A)			1.0%	150,700
	MOBILIZATION (8% OF SUBTOTAL A)			8.0%	1,205,500
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)			20.0%	3,013,800
	SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)				**$21,021,300**
OTHER PROJ	**OTHER PROJECT COSTS**				
	DPS TRAFFIC CONTROL				0
	JOINT PROJECT AGREEMENT ITEMS				0
	CONTRACTOR INCENTIVES				0
	ENVIRONMENTAL MITIGATION	MILE	1	1,000,000	1,000,000
	PRESENT YEAR CONSTRUCTION BID COST (EXCLUDING UTILITIES & R/W)				**$22,021,300**
INFL	**INFLATION AND BELOW THE LINE ITEMS**				
	LABOR AND MATERIAL INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			NOT INCLUDED	0
	POST DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	220,200
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL A)			5.0%	1,101,100
	CONSTRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	1,761,700
	INDIRECT COST ALLOCATION (9.9% OF SUBTOTAL B + OTHER PROJECT COSTS)			9.90%	2,485,300
	CONSTRUCTION YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)				**$27,589,600**
DES	**PREDESIGN AND FINAL DESIGN**				
	PREDESIGN/NEPA/PI SERVICES (3% OF CONSTRUCTION YEAR COST)			3.0%	660,600
	FINAL DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST)			8.0%	1,761,700
	INDIRECT COST ALLOCATION (9.9% OF ALL DESIGN COSTS)			9.90%	239,800
	TOTAL ESTIMATED DESIGN COST				**$2,662,100**
UTIL	**UTILITY RELOCATION**				
	PRIOR RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS				0
	INDIRECT COST ALLOCATION (9.9% OF ALL UTILITY COSTS)			9.90%	0
	UTILITY RELOCATION COST INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	TOTAL ESTIMATED UTILITY COST				**$0**
R/W	**RIGHT-OF-WAY**				
	RIGHT-OF-WAY	L. SUM	1	5,850,000	5,850,000
	INDIRECT COST ALLOCATION (9.9% OF ALL RIGHT-OF-WAY COSTS)			9.90%	579,200
	RIGHT-OF-WAY PRICE ESCALATION TO ACQUISITION YEAR 20xx (X%/YR)			1.00	0
	ACQUISITION YEAR RIGHT-OF-WAY COSTS				**$6,429,200**
	TOTAL ESTIMATED PROJECT COST				**$36,681,000**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L
SEGMENT: 75th Ave TI
LENGTH:
ADOT PROJECT NO.:
PROJECT DESCRIPTION: Triple Lefts EB 67th Ramp Relocation
ESTIMATE LEVEL: Level 0
DATE: 1/20/20

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	$ 210,000.00	210,000
	ROADWAY EXCAVATION	CU.YD.	21,000	$ 20.00	420,000
	DRAINAGE EXCAVATION	CU.YD.		$ 8.00	
	BORROW	CU.YD.		$ 16.00	
	SUBGRADE TREATMENT	SQ.YD.		$ 15.00	
	FURNISH WATER	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 200				630,000
300 & 400	**BASE AND SURFACE TREATMENT**				
	AGGREGATE BASE	SQ.YD.	51,382	$ 10.00	513,820
	CONCRETE PAVEMENT	SQ.YD.	32,087	$ 62.00	1,989,370
	ASPHALT PAVEMENT	SQ.YD.	19,295	$ 34.00	656,030
	ARAC SURFACE	SQ.YD.		$ 6.00	
	MILLING & OVERLAY	SQ.YD.		$ 16.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 300 & 400				3,159,220
500	**DRAINAGE**				
	DRAINAGE SYSTEM (CLOSED)	L.FT.		$ 240.00	
	DRAINAGE SYSTEM (OPEN)	L.FT.		$ 185.00	
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.		$ 415.00	
	PUMP STATION (NEW)	EACH		$ 2,500,000.00	
	PIPE CULVERTS	L.FT.		$ 365.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 500				0
600	**STRUCTURES**				
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.		$ 135.00	
	FLYOVER HOV RAMP	SQ.FT.		$ 175.00	
	OVERPASS TI BRIDGE	SQ.FT.		$ 140.00	
	RIVER CROSSING BRIDGE	SQ.FT.		$ 145.00	
	PEDESTRIAN BRIDGE	SQ.FT.		$ 180.00	
	BRIDGE WIDENING	SQ.FT.		$ 160.00	
	BRIDGE REHABILITATION	SQ.FT.		$ 100.00	
	BOX CULVERT	L.FT./CELL		$ 1,330.00	
	SIGN STRUCTURES	EACH		$ 100,000.00	
	ITS STRUCTURE AND PANEL	EACH		$ 200,000.00	
	O&M CROSSING	EACH		$ 350,000.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 600				0
700	**TRAFFIC ENGINEERING**				
	SIGNING (FREEWAY)	MILE/DIR	1.5	$ 35,000.00	52,500
	SIGNING (STREET)	MILE	1.00	$ 65,000.00	65,000
	PAVEMENT MARKING	LANE-MILE	6.00	$ 5,000.00	30,000
	LIGHTING	MILE	1.00	$ 375,000.00	375,000
	TRAFFIC SIGNAL	EACH	2	$ 250,000.00	500,000
	INTELLIGENT TRANSPORTATION SYSTEM (ITS)	MILE		$ 525,000.00	
	MISCELLANEOUS ITEMS	L.SUM		$ 1,700,000.00	
	TOTAL ITEM 700				1,022,500
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING AND TOPSOIL	SQ.YD.		$ 15.00	
	UTILITY RELOCATION	L.SUM	1	$ 1,000,000.00	1,000,000
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 800				1,000,000
900	**INCIDENTALS**				
	RETAINING WALLS	SQ.FT.	38,000	$ 75.00	2,850,000
	SOUND WALLS	SQ.FT.		$ 40.00	
	ROADWAY APPURTENANCES	L.SUM	1	$ 750,000.00	750,000
	ADA IMPROVEMENTS	EACH	2	$ 2,500.00	5,000
	TRANSIT APPURTENANCES	L.SUM			
	RAILROAD ACCOMMODATIONS	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 900				3,605,000
	SUBTOTAL A (ITEM SUBTOTAL)				**$9,416,700**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L **PROJECT DESCRIPTION:** Triple Lefts EB 67th Ramp Relocation
SEGMENT: 75th Ave TI **ESTIMATE LEVEL:** Level 0
LENGTH: **ADOT PROJECT NO.:** **DATE:** 1/20/20

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
PW	**PROJECT WIDE**				
	TRAFFIC CONTROL (8% OF SUBTOTAL A)			8.0%	753,300
	DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER)			0.0%	0
	QUALITY CONTROL (1% OF SUBTOTAL A)			1.0%	94,200
	CONSTRUCTION SURVEYING (1.5% OF SUBTOTAL A)			1.5%	141,300
	EROSION CONTROL (1% OF SUBTOTAL A)			1.0%	94,200
	MOBILIZATION (8% OF SUBTOTAL A)			8.0%	753,300
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)			20.0%	1,883,300
	SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)				**$13,136,300**
OTHER PROJ	**OTHER PROJECT COSTS**				
	DPS TRAFFIC CONTROL				0
	JOINT PROJECT AGREEMENT ITEMS				0
	CONTRACTOR INCENTIVES				0
	ENVIRONMENTAL MITIGATION	MILE	1	1,000,000	1,000,000
	PRESENT YEAR CONSTRUCTION BID COST (EXCLUDING UTILITIES & R/W)				**$14,136,300**
INFL	**INFLATION AND BELOW THE LINE ITEMS**				
	LABOR AND MATERIAL INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			NOT INCLUDED	0
	POST DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	141,400
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL A)			5.0%	706,800
	CONSTRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	1,130,900
	INDIRECT COST ALLOCATION (9.9% OF SUBTOTAL B + OTHER PROJECT COSTS)			9.90%	1,595,400
	CONSTRUCTION YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)				**$17,710,800**
DES	**PREDESIGN AND FINAL DESIGN**				
	PREDESIGN/NEPA/PI SERVICES (3% OF CONSTRUCTION YEAR COST)			3.0%	424,100
	FINAL DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST)			8.0%	1,130,900
	INDIRECT COST ALLOCATION (9.9% OF ALL DESIGN COSTS)			9.90%	153,900
	TOTAL ESTIMATED DESIGN COST				**$1,708,900**
UTIL	**UTILITY RELOCATION**				
	PRIOR RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS				0
	INDIRECT COST ALLOCATION (9.9% OF ALL UTILITY COSTS)			9.90%	0
	UTILITY RELOCATION COST INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	TOTAL ESTIMATED UTILITY COST				**$0**
R/W	**RIGHT-OF-WAY**				
	RIGHT-OF-WAY	L. SUM	1	5,850,000	5,850,000
	INDIRECT COST ALLOCATION (9.9% OF ALL RIGHT-OF-WAY COSTS)			9.90%	579,200
	RIGHT-OF-WAY PRICE ESCALATION TO ACQUISITION YEAR 20xx (X%/YR)			1.00	0
	ACQUISITION YEAR RIGHT-OF-WAY COSTS				**$6,429,200**
	TOTAL ESTIMATED PROJECT COST				**$25,849,000**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L **PROJECT DESCRIPTION:** DDI
SEGMENT: 75th Ave TI **ESTIMATE LEVEL:** Level 0
LENGTH: **ADOT PROJECT NO.:** **DATE:** 12/20/19

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	$ 225,000.00	225,000
	ROADWAY EXCAVATION	CU.YD.	27,000	$ 20.00	540,000
	DRAINAGE EXCAVATION	CU.YD.		$ 8.00	
	BORROW	CU.YD.		$ 16.00	
	SUBGRADE TREATMENT	SQ.YD.		$ 15.00	
	FURNISH WATER	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 200				765,000
300 & 400	**BASE AND SURFACE TREATMENT**				
	AGGREGATE BASE	SQ.YD.	54,106	$ 10.00	541,060
	CONCRETE PAVEMENT	SQ.YD.	49,142	$ 62.00	3,046,780
	ASPHALT PAVEMENT	SQ.YD.	4,965	$ 34.00	168,800
	ARAC SURFACE	SQ.YD.		$ 6.00	
	MILLING & OVERLAY	SQ.YD.		$ 16.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 300 & 400				3,756,640
500	**DRAINAGE**				
	DRAINAGE SYSTEM (CLOSED)	L.FT.		$ 240.00	
	DRAINAGE SYSTEM (OPEN)	L.FT.		$ 185.00	
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.	300	$ 415.00	124,500
	PUMP STATION (NEW)	EACH		$ 2,500,000.00	
	PIPE CULVERTS	L.FT.		$ 365.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 500				124,500
600	**STRUCTURES**				
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.	23,245	$ 135.00	3,138,080
	FLYOVER HOV RAMP	SQ.FT.		$ 175.00	
	OVERPASS TI BRIDGE	SQ.FT.		$ 140.00	
	RIVER CROSSING BRIDGE	SQ.FT.		$ 145.00	
	PEDESTRIAN BRIDGE	SQ.FT.		$ 180.00	
	BRIDGE WIDENING	SQ.FT.		$ 160.00	
	BRIDGE REHABILITATION	SQ.FT.		$ 100.00	
	BOX CULVERT	L.FT./CELL		$ 1,330.00	
	SIGN STRUCTURES	EACH		$ 100,000.00	
	ITS STRUCTURE AND PANEL	EACH		$ 200,000.00	
	O&M CROSSING	EACH		$ 350,000.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 600				3,138,080
700	**TRAFFIC ENGINEERING**				
	SIGNING (FREEWAY)	MILE/DIR	2.3	$ 35,000.00	78,870
	SIGNING (STREET)	MILE	0.4	$ 65,000.00	23,400
	PAVEMENT MARKING	LANE-MILE	5.9	$ 5,000.00	29,730
	LIGHTING	MILE	0.75	$ 375,000.00	281,680
	TRAFFIC SIGNAL	EACH		$ 250,000.00	
	INTELLIGENT TRANSPORTATION SYSTEM (ITS)	MILE		$ 525,000.00	
	MISCELLANEOUS ITEMS	L.SUM		$ 1,700,000.00	
	TOTAL ITEM 700				413,680
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING AND TOPSOIL	SQ.YD.		$ 15.00	
	UTILITY RELOCATION	L.SUM	1	$ 1,000,000.00	1,000,000
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 800				1,000,000
900	**INCIDENTALS**				
	RETAINING WALLS	SQ.FT.	104,865	$ 75.00	7,864,880
	SOUND WALLS	SQ.FT.	31,275	$ 40.00	1,251,000
	ROADWAY APPURTENANCES	L.SUM	1	$ 500,000.00	500,000
	ADA IMPROVEMENTS	EACH		$ 2,500.00	
	TRANSIT APPURTENANCES	L.SUM			
	RAILROAD ACCOMMODATIONS	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 900				9,615,880
	SUBTOTAL A (ITEM SUBTOTAL)				**$18,813,800**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L **PROJECT DESCRIPTION:** DDI
SEGMENT: 75th Ave TI **ESTIMATE LEVEL:** Level 0
LENGTH: **ADOT PROJECT NO.:** **DATE:** 12/20/19

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
PW	**PROJECT WIDE**				
	TRAFFIC CONTROL (8% OF SUBTOTAL A)			8.0%	1,505,100
	DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER)			0.0%	0
	QUALITY CONTROL (1% OF SUBTOTAL A)			1.0%	188,100
	CONSTRUCTION SURVEYING (1.5% OF SUBTOTAL A)			1.5%	282,200
	EROSION CONTROL (1% OF SUBTOTAL A)			1.0%	188,100
	MOBILIZATION (8% OF SUBTOTAL A)			8.0%	1,505,100
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)			20.0%	3,762,800
	SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)				**$26,245,200**
OTHER PROJ	**OTHER PROJECT COSTS**				
	DPS TRAFFIC CONTROL				0
	JOINT PROJECT AGREEMENT ITEMS				0
	CONTRACTOR INCENTIVES				0
	ENVIRONMENTAL MITIGATION	MILE	1	1,000,000	1,000,000
	PRESENT YEAR CONSTRUCTION BID COST (EXCLUDING UTILITIES & R/W)				**$27,245,200**
INFL	**INFLATION AND BELOW THE LINE ITEMS**				
	LABOR AND MATERIAL INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			NOT INCLUDED	0
	POST DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	272,500
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL A)			5.0%	1,362,300
	CONSTRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	2,179,600
	INDIRECT COST ALLOCATION (9.9% OF SUBTOTAL B + OTHER PROJECT COSTS)			9.90%	3,074,900
	CONSTRUCTION YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)				**$34,134,500**
DES	**PREDESIGN AND FINAL DESIGN**				
	PREDESIGN/NEPA/PI SERVICES (3% OF CONSTRUCTION YEAR COST)			3.0%	817,400
	FINAL DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST)			8.0%	2,179,600
	INDIRECT COST ALLOCATION (9.9% OF ALL DESIGN COSTS)			9.90%	296,700
	TOTAL ESTIMATED DESIGN COST				**$3,293,700**
UTIL	**UTILITY RELOCATION**				
	PRIOR RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS				0
	INDIRECT COST ALLOCATION (9.9% OF ALL UTILITY COSTS)			9.90%	0
	UTILITY RELOCATION COST INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	TOTAL ESTIMATED UTILITY COST				**$0**
R/W	**RIGHT-OF-WAY**				
	RIGHT-OF-WAY	L. SUM	1	5,850,000	5,850,000
	INDIRECT COST ALLOCATION (9.9% OF ALL RIGHT-OF-WAY COSTS)			9.90%	579,200
	RIGHT-OF-WAY PRICE ESCALATION TO ACQUISITION YEAR 20xx (X%/YR)			1.00	0
	ACQUISITION YEAR RIGHT-OF-WAY COSTS				**$6,429,200**
	TOTAL ESTIMATED PROJECT COST				**$43,857,000**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L **PROJECT DESCRIPTION:** Flyover
SEGMENT: 75th Ave TI **ESTIMATE LEVEL:** Level 0
LENGTH: **ADOT PROJECT NO.:** **DATE:** 12/20/19

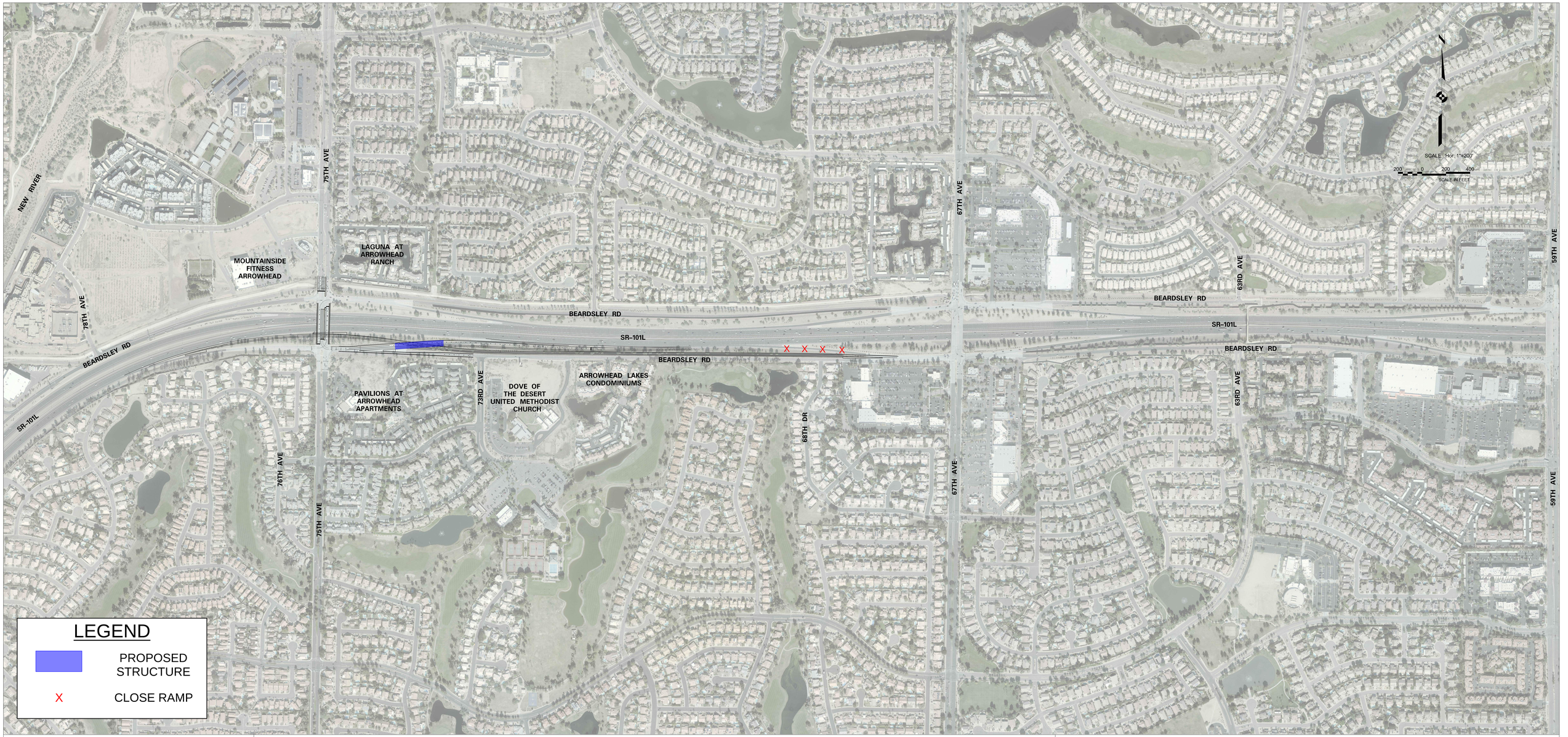
ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	$ 270,000.00	270,000
	ROADWAY EXCAVATION	CU.YD.	20,000	$ 20.00	400,000
	DRAINAGE EXCAVATION	CU.YD.		$ 8.00	
	BORROW	CU.YD.		$ 16.00	
	SUBGRADE TREATMENT	SQ.YD.		$ 15.00	
	FURNISH WATER	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 200				670,000
300 & 400	**BASE AND SURFACE TREATMENT**				
	AGGREGATE BASE	SQ.YD.	54,524	$ 10.00	545,240
	CONCRETE PAVEMENT	SQ.YD.	47,756	$ 62.00	2,960,890
	ASPHALT PAVEMENT	SQ.YD.	6,767	$ 34.00	230,090
	ARAC SURFACE	SQ.YD.		$ 6.00	
	MILLING & OVERLAY	SQ.YD.		$ 16.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 300 & 400				3,736,220
500	**DRAINAGE**				
	DRAINAGE SYSTEM (CLOSED)	L.FT.		$ 240.00	
	DRAINAGE SYSTEM (OPEN)	L.FT.		$ 185.00	
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.		$ 415.00	
	PUMP STATION (NEW)	EACH		$ 2,500,000.00	
	PIPE CULVERTS	L.FT.		$ 365.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 500				0
600	**STRUCTURES**				
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.		$ 135.00	
	FLYOVER HOV RAMP	SQ.FT.	34,880	$ 175.00	6,104,000
	OVERPASS TI BRIDGE	SQ.FT.		$ 140.00	
	RIVER CROSSING BRIDGE	SQ.FT.		$ 145.00	
	PEDESTRIAN BRIDGE	SQ.FT.		$ 180.00	
	BRIDGE WIDENING	SQ.FT.		$ 160.00	
	BRIDGE REHABILITATION	SQ.FT.		$ 100.00	
	BOX CULVERT	L.FT./CELL		$ 1,330.00	
	SIGN STRUCTURES	EACH		$ 100,000.00	
	ITS STRUCTURE AND PANEL	EACH		$ 200,000.00	
	O&M CROSSING	EACH		$ 350,000.00	
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 600				6,104,000
700	**TRAFFIC ENGINEERING**				
	SIGNING (FREEWAY)	MILE/DIR	1.5	$ 35,000.00	52,500
	SIGNING (STREET)	MILE	0.75	$ 65,000.00	48,750
	PAVEMENT MARKING	LANE-MILE	4.00	$ 5,000.00	20,000
	LIGHTING	MILE	0.50	$ 375,000.00	187,500
	TRAFFIC SIGNAL	EACH		$ 250,000.00	
	INTELLIGENT TRANSPORTATION SYSTEM (ITS)	MILE		$ 525,000.00	
	MISCELLANEOUS ITEMS	L.SUM		$ 1,700,000.00	
	TOTAL ITEM 700				308,750
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING AND TOPSOIL	SQ.YD.		$ 15.00	
	UTILITY RELOCATION	L.SUM	1	$ 1,000,000.00	1,000,000
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 800				1,000,000
900	**INCIDENTALS**				
	RETAINING WALLS	SQ.FT.	67,500	$ 75.00	5,062,500
	SOUND WALLS	SQ.FT.	34,500	$ 40.00	1,380,000
	ROADWAY APPURTENANCES	L.SUM	1	$ 500,000.00	500,000
	ADA IMPROVEMENTS	EACH		$ 2,500.00	
	TRANSIT APPURTENANCES	L.SUM			
	RAILROAD ACCOMMODATIONS	L.SUM			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 900				6,942,500
	SUBTOTAL A (ITEM SUBTOTAL)				**$18,761,500**

MARICOPA ASSOCIATION OF GOVERNMENTS
CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: SR-101L **PROJECT DESCRIPTION:** Flyover
SEGMENT: 75th Ave TI **ESTIMATE LEVEL:** Level 0
LENGTH: **ADOT PROJECT NO.:** **DATE:** 12/20/19

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
PW	**PROJECT WIDE**				
	TRAFFIC CONTROL (8% OF SUBTOTAL A)			8.0%	1,500,900
	DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER)			0.0%	0
	QUALITY CONTROL (1% OF SUBTOTAL A)			1.0%	187,600
	CONSTRUCTION SURVEYING (1.5% OF SUBTOTAL A)			1.5%	281,400
	EROSION CONTROL (1% OF SUBTOTAL A)			1.0%	187,600
	MOBILIZATION (8% OF SUBTOTAL A)			8.0%	1,500,900
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)			20.0%	3,752,300
	SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)				**$26,172,200**
OTHER PROJ	**OTHER PROJECT COSTS**				
	DPS TRAFFIC CONTROL				0
	JOINT PROJECT AGREEMENT ITEMS				0
	CONTRACTOR INCENTIVES				0
	ENVIRONMENTAL MITIGATION	MILE	1	1,000,000	1,000,000
	PRESENT YEAR CONSTRUCTION BID COST (EXCLUDING UTILITIES & R/W)				**$27,172,200**
INFL	**INFLATION AND BELOW THE LINE ITEMS**				
	LABOR AND MATERIAL INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			NOT INCLUDED	0
	POST DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	271,700
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL A)			5.0%	1,358,600
	CONSTRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	2,173,800
	INDIRECT COST ALLOCATION (9.9% OF SUBTOTAL B + OTHER PROJECT COSTS)			9.90%	3,066,700
	CONSTRUCTION YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)				**$34,043,000**
DES	**PREDESIGN AND FINAL DESIGN**				
	PREDESIGN/NEPA/PI SERVICES (3% OF CONSTRUCTION YEAR COST)			3.0%	815,200
	FINAL DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST)			8.0%	2,173,800
	INDIRECT COST ALLOCATION (9.9% OF ALL DESIGN COSTS)			9.90%	295,900
	TOTAL ESTIMATED DESIGN COST				**$3,284,900**
UTIL	**UTILITY RELOCATION**				
	PRIOR RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS				0
	INDIRECT COST ALLOCATION (9.9% OF ALL UTILITY COSTS)			9.90%	0
	UTILITY RELOCATION COST INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	TOTAL ESTIMATED UTILITY COST				**$0**
R/W	**RIGHT-OF-WAY**				
	RIGHT-OF-WAY	L. SUM	1	5,850,000	5,850,000
	INDIRECT COST ALLOCATION (9.9% OF ALL RIGHT-OF-WAY COSTS)			9.90%	579,200
	RIGHT-OF-WAY PRICE ESCALATION TO ACQUISITION YEAR 20xx (X%/YR)			1.00	0
	ACQUISITION YEAR RIGHT-OF-WAY COSTS				**$6,429,200**
	TOTAL ESTIMATED PROJECT COST				**$43,757,000**

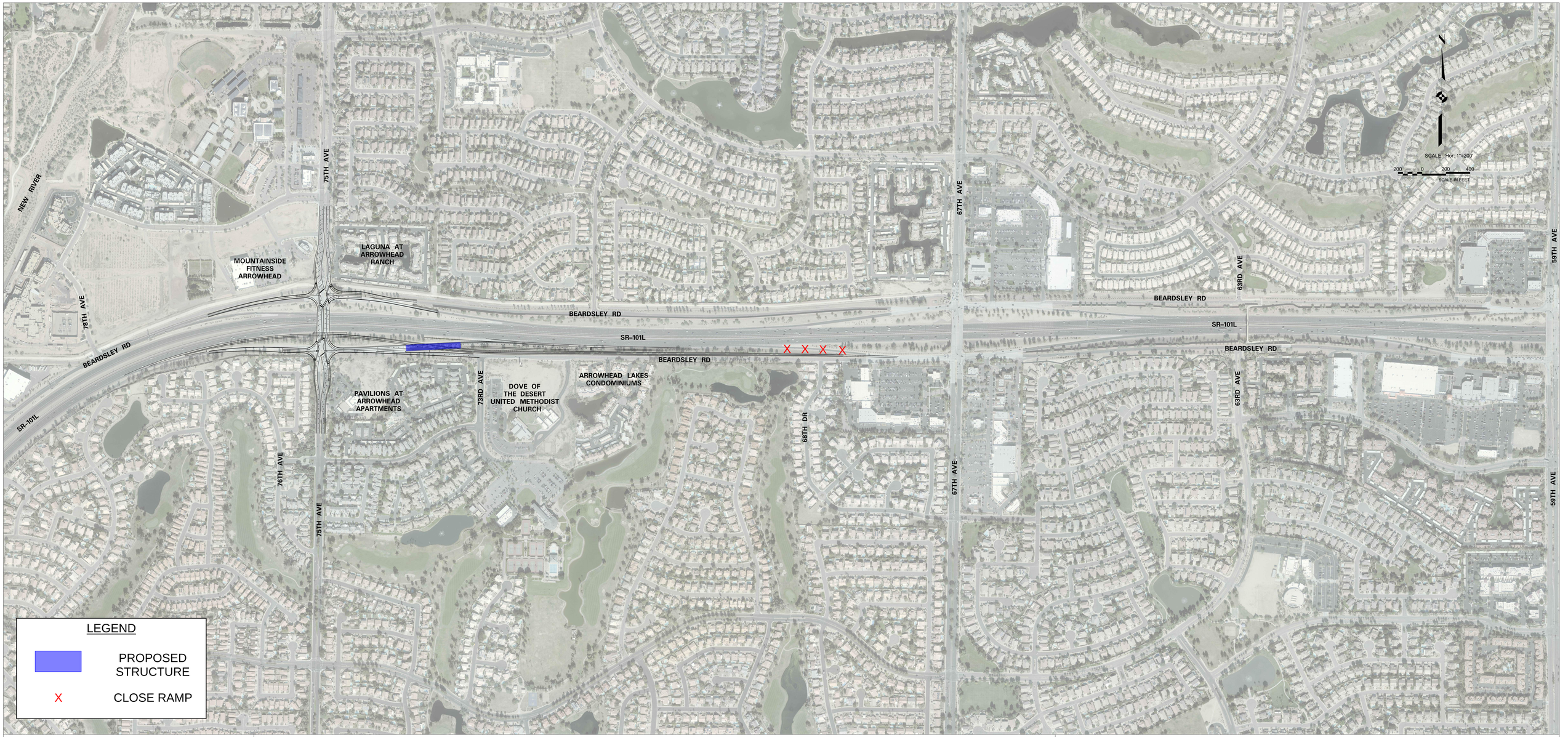
Appendix H



B&N
burgessniple.com

SR-101L/75th AVENUE SERVICE TRAFFIC INTERCHANGE
FEASIBILITY ANALYSIS
75th AVENUE ALTERNATIVE A - THREE LEFTS

MARICOPA ASSOCIATION of GOVERNMENTS



B&N
burgessniple.com

SR-101L/75th AVENUE SERVICE TRAFFIC INTERCHANGE
FEASIBILITY ANALYSIS
75th AVENUE ALTERNATIVE B - DIVERGING DIAMOND INTERCHANGE

MARICOPA ASSOCIATION of GOVERNMENTS

B&N
burgessniple.com

SR-101L/75th AVENUE SERVICE TRAFFIC INTERCHANGE
FEASIBILITY ANALYSIS
75th AVENUE ALTERNATIVE C - FLYOVER

MARICOPA ASSOCIATION of GOVERNMENTS

B&N
burgessniple.com

SR-101L/75th AVENUE SERVICE TRAFFIC INTERCHANGE FEASIBILITY ANALYSIS
75th AVENUE ALTERNATIVE D - THREE LEFTS

MARICOPA ASSOCIATION of GOVERNMENTS

Appendix I

Beardsley Road Flyover

This alternative analyzes a flyover from eastbound Beardsley Road to eastbound SR-101L. The single-lane flyover separates from Beardsley Road west of the New River and joins with the outside auxiliary lane of SR-101L approximately 1,500 feet west of the 75th Avenue TI.

The Beardsley Road Flyover is expected to reduce the southbound travel demand along 75th Avenue and generally improve the operations at the 75th Avenue TI with SR-101L.

Travel demand analysis of the alternate with the Beardsley Road entrance ramp indicates that the travel demand on the entrance ramp from 75th Avenue to SR-101L eastbound decreases by 28 percent in a 24-hour period; the left turn demand from 75th Avenue southbound to eastbound Beardsley Road decreases by 32 percent. In the peak hour conditions when the left turning traffic from southbound 75th Avenue to eastbound Beardsley Road is the heaviest, the demand is expected to decrease by 450 vehicles per hour. This reduction in travel demand on 75th Avenue will result in improved and acceptable operations on 75th Avenue in its current configuration through the horizon year of 2040. No improvements are made to the 75th Avenue TI.

Beardsley Road access and the existing structure over SR-101L are preserved.

The traffic analysis performed did not consider the impacts associated with increased travel demand on intersections along Beardsley Road and Lake Pleasant Parkway to the north and west of the study area.

Geometrics were not drafted for this alternative; subsequently, no cost estimate was developed for this alternative. A review of likely impacts was completed and an overview of the changes along mainline SR-101L are shown in **Figure 1**. Access modifications include the new Beardsley Road flyover, removal of the Texas U structure over SR-101L near at Union Hills Drive, relocation of the existing entrance ramp from Union Hills Drive to SR-101L eastbound, and reconstruction of the 75th Avenue exit ramp.

Figure 1 – Beardsley Road Flyover Overview